

Mr. John Grantham
State of Washington
Department of Ecology
Nuclear & Mixed Waste Program
P. O. Box 47600
Olympia, WA 98504-7600

FLUOR DANIEL, INC.

Date: February 2, 1993

Reference: Hanford Waste Vitrification Plant
DOE Contract DE-AC06-86RL10838
Fluor Contract 8457

Transmittal No.: WDOE-316

Dear Mr. Grantham:

TRANSMITTAL

We enclose * copy of the items listed below. These are issued per US-DOE request.
*3 FULLSIZE BLUELINES ROLLED & 2 SPECIFICATIONS, & 1 REDUCED

Response due to Fluor: N/A

Responds to: P33B PACKAGE

NUMBER	REV	DATE	TITLE
SEE TRANSMITTAL ATTACHMENT	----	-----	P33B PACKAGE PROCESS SUPPORT VESSELS AND EQUIPMENT VITRIFICATION BUILDING
			REFERENCE DOCUMENTS LIST RECONCILIATION LIST

Distribution:

Reference: FRP-727, FUP-346

R. L. Long: DOE-RL, w/O

TWP/AME Corresp Cntrl Cntr, MSIN A5-10
(P33B PACKAGE), w/O

P. Felise, WHC-RL (MSIN G6-16), w/1F, 1 SPEC

Environmental Data Management Center

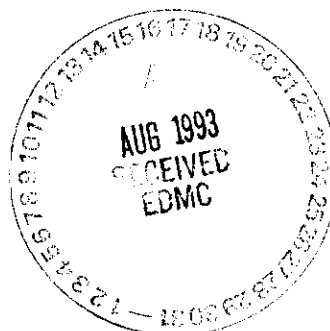
(MSIN H6-08), w/1F, 1 SPEC

D. Duncan, US EPA, Region X, w/O

Very truly yours,

R. S. Poulter
R. S. Poulter
Project Director

RSP:ED:lt



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 STATUS DATE 01/29/93
 CONTRACT 845734

CORDS TRANSMITTAL ATTACHMENT

DISCIPLINE	PACKAGE	DRAWING NUMBER	SHEET NUMBER	DWG REV	SIGNATURE DATE	DRAWING TITLE
30	P33B	H-2-116011	1	0		PROCESS SUPPORT VESSELS AND EQUIPMENT VIT BLDG TITLE SHEET
30	P33B	H-2-116012	1	0		PROCESS SUPPORT VESSELS AND EQUIPMENT VIT BLDG DWG INDEX
40	P33B	H-2-120151	1	0		TK-540-014 NITRIC ACID DECON FEED TANK
40	P33B	H-2-120151	2	0		TK-540-014 NITRIC ACID DECON FEED TANK DETAILS
40	P33B	H-2-120152	1	0		TK-540-017 OXALIC ACID DECON FEED TANK
40	P33B	H-2-120156	1	0		TK-210-001 CRANE DECON FEED TANK (ACID)
40	P33B	H-2-120156	2	0		TK-210-001 CRANE DECON FEED TANK (ACID) DETAILS
40	P33B	H-2-120157	1	0		TK-210-002 CRANE DECON FEED TANK (CAUSTIC)
40	P33B	H-2-120157	2	0		TK-210-002 CRANE DECON FEED TANK (CAUSTIC) DETAILS
40	P33B	H-2-120161	1	0		TK-450-001 PROCESS COOLING WATER EXPANSION TANK
40	P33B	H-2-120162	1	0		TK-460-001 MELTER COOLING WATER EXPANSION TANK
40	P33B	H-2-120163	1	0		TK-480-001 PROCESS WATER TANK
40	P33B	H-2-120164	1	0		TK-520-001 FLOOR DRAIN CATCH TANK
40	P33B	H-2-120164	2	0		TK-520-001 FLOOR DRAIN CATCH TANK DETAILS
40	P33B	H-2-120165	1	0		TK-520-002 REGULATED DRAINS CATCH TANK
40	P33B	H-2-120165	2	0		TK-520-002 REGULATED DRAINS CATCH TANK DETAILS
40	P33B	H-2-120166	1	0		TK-520-003 ACID DRAIN CATCH TANK
40	P33B	H-2-120166	2	0		TK-520-003 ACID DRAIN CATCH TANK DETAILS
40	P33B	H-2-120167	1	0		TK-520-004 ORGANIC ACID DRAIN CATCH TANK
40	P33B	H-2-120167	2	0		TK-520-004 ORGANIC ACID DRAIN CATCH TANK DETAILS
40	P33B	H-2-120168	1	0		TK-520-005 FLOOR DRAIN SAMPLING TANK
40	P33B	H-2-120168	2	0		TK-520-005 FLOOR DRAIN SAMPLING TANK DETAILS
40	P33B	H-2-120169	1	0		TK-540-002 SUGAR SOLUTION FEED TANK
40	P33B	H-2-120170	1	0		TK-540-004 OFFGAS TREATMENT CHEMICAL FEED TANK
40	P33B	H-2-120171	1	0		TK-540-006 KOH/FRIT MODIFIER FEED TANK
40	P33B	H-2-120172	1	0		TK-540-008 FORMIC ACID FEED TANK
40	P33B	H-2-120173	1	0		TK-540-012 50% NITRIC ACID FEED TANK
40	P33B	H-2-120174	1	0		TK-540-019 POTASSIUM PERMANGANATE FEED TANK
40	P33B	H-2-120175	1	0		TK-540-021 SODIUM NITRITE FEED TANK
40	P33B	H-2-120176	1	0		TK-540-023 50% CAUSTIC FEED TANK
40	P33B	H-2-120177	1	0		TK-540-024 FLUSH WATER FEED TANK

00/PIPING & INSTRUMENT DIAGRAMS, 05/CIVIL, 10/HVAC, 20/STRUCTURAL, 30/ARCHITECTURAL, 40/MECHANICAL, 50/PIPING, 51/FIRE PROTECTION, 60/ELECTRICAL, 70/CONTROL SYSTEMS, 90/MISCELLANEOUS

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CORDS TRANSMITTAL ATTACHMENT

DISCIPLINE	PACKAGE	DRAWING NUMBER	SHEET NUMBER	DWG REV	SIGNATURE DATE	DRAWING TITLE
40	P338	H-2-120178	1	0		TK-540-027 DIATOMACEOUS EARTH SLURRY FEED TANK
40	P338	H-2-120179	1	0		TK-540-029 ZEOLITE SLURRY FEED TANK
40	P338	H-2-120180	1	0		TK-540-031 DILUTE SODIUM HYDROXIDE FEED TANK
40	P338	H-2-120181	1	0		TK-580-002 PROCESS FRIT SLURRY FEED TANK (PFSFT)
40	P338	H-2-120181	2	0		TK-580-002 PROCESS FRIT SLURRY FEED TANK (PFSFT) DETAILS
40	P338	H-2-120182	1	0		TK-580-003 DECON FRIT SLURRY FEED TANK (DFSFT)
40	P338	H-2-120182	2	0		TK-580-003 DECON FRIT SLURRY FEED TANK (DFSFT) DETAILS
40	P338	H-2-120442	1	0		TK-540-034 ANTIFOAM FEED TANK
70	P338	H-2-121653	1	0		LP-580-003 & 004 INSTRUMENT PANEL LAYOUT

TOTAL: 46

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DISCIPLINE	PACKAGE SPECIFICATION NUMBER	PKG REV	PACKAGE TITLE	SIGNATURE DATE	SECTION NUMBER	SECTION REV	SECTION TITLE
	P338	B-595-P-P338	0	PROCESS SUPPORT VESSELS AND EQUIPMENT VITRIFICATION BUILDING			
40	P338				01730	0	OPERATION AND MAINTENANCE DATA
40	P338				05063	0	WELDING PRESSURE VESSELS
40	P338				05066	0	WELDING SPECIALTY EQUIPMENT
40	P338				13252	0	PRECAUTIONS FOR FABRICATION, HANDLING AND STORAGE OF STAINLESS STEEL AND NICKEL ALLOYS
40	P338				14583	0	COLD FEED AGITATORS
40	P338				14584W	0	COLD FEED AGITATOR
40	P338				15139	0	AIR DRIVEN DIAPHRAGM PUMPS
40	P338				15141	0	CENTRIFUGAL PUMPS
40	P338				15145	0	SUMP PUMPS
40	P338				15148	0	SEALLESS PUMPS
40	P338				15196	0	IDENTIFICATION AND TAGGING METHODS FOR MECHANICAL EQUIPMENT
40	P338				15648	0	PLATE HEAT EXCHANGERS
40	P338				15649	0	METERING PUMPS
40	P338				15820	0	VACUUM BLOWERS
40	P338				15821	0	CENTRIFUGAL BLOWERS
40	P338				15894	0	VIBRATING FILTERS
40	P338				15896	0	ROUGHING FILTERS/HEPA FILTERS (MECHANICAL)
40	P338				15898	0	HEPA FILTERS
40	P338				16150	0	MOTORS - INDUCTION FOR GENERAL SERVICE
60	P338				16610	0	ELECTRICAL REQUIREMENTS FOR PACKAGED MECHANICAL EQUIPMENT
70	P338				17703	0	INSTRUMENT PIPING MATERIALS
70	P338				17704	0	GENERAL INSTRUMENTATION INSTALLATION AND TESTING
70	P338				17892	0	FRIT SLURRY FILTER LOCAL PANELS
70	P338				17893	0	INSTRUMENTS FURNISHED WITH MECHANICAL EQUIPMENT FRIT SLURRY FILTERS
90	P338				13433	0	PRESSURE VESSELS - STAINLESS STEEL

00/PIPING & INSTRUMENT DIAGRAMS, 05/CIVIL, 10/HVAC, 20/STRUCTURAL, 30/ARCHITECTURAL, 40/MECHANICAL, 50/PIPING, 51/FIRE PROTECTION, 57/PIPING STRESS,
 58/PIPING MATERIAL, 60/ELECTRICAL, 70/CONTROL SYSTEMS, 90/MISCELLANEOUS

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CORDS TRANSMITTAL ATTACHMENT

DISCIPLINE	PACKAGE SPECIFICATION	PKG	PACKAGE TITLE	SIGNATURE	SECTION	SECTION	SECTION TITLE
	NUMBER	REV		DATE	NUMBER	REV	

TOTAL: 26

00/PIPING & INSTRUMENT DIAGRAMS, 05/CIVIL, 10/HVAC, 20/STRUCTURAL, 30/ARCHITECTURAL, 40/MECHANICAL, 50/PIPING, 51/FIRE PROTECTION, 57/PIPING STRESS, 58/PIPING MATERIAL, 60/ELECTRICAL, 70/CONTROL SYSTEMS, 90/MISCELLANEOUS

P33B - PROCESS SUPPORT VESSEL AND EQUIPMENT

LIST OF REFERENCE DWGS

<u>P33B</u> <u>DOCUMENT</u>	<u>REF DWG</u> <u>NUMBER</u>	<u>REV</u> <u>NO.</u>	<u>REF</u> <u>DWG TITLE</u>
SPEC SECTION 17893	H-2-123070 SH 4 SH 6	5 5	P&ID - SYS 58 PROCESS FRIT SLURRY PUMP AND FILTER
17892	H-2-123070 SH 4 SH 6	5 5	P&ID - SYS 58 PROCESS FRIT SLURRY PUMP AND FILTER

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ATTACHMENT 1

RECONCILIATION LIST
PROCUREMENT PACKAGE P33B
VIT BLDG. OUT-OF-CELL TANKS AND ASSOCIATED EQUIPMENT
January 27, 1993

- 1 HWVP-0905 "Vit Bldg. and Non-Vit Bldg. Sampling Requirements"
must be approved prior to P33B AFC issue February 2, 1993.
NOTE: HWVP-0905 was approved on February 1, 1993.
2. Tank nozzle orientations are subject to change after final piping
layouts are completed and plastic model review comments have been
incorporated.

SPECIFICATIONS

PROCESS SUPPORT VESSELS
AND EQUIPMENT VITRIFICATION
BUILDING

30014

B-595-P-P33B

HANFORD WASTE VITRIFICATION PLANT

U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE



FLUOR DANIEL
ADVANCED TECHNOLOGY DIVISION
CONTRACT 8457

DOE CONTRACT NO.
DE-AC06-86RL10838

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

PROCESS SUPPORT VESSELS AND EQUIPMENT
VITRIFICATION BUILDING
SPECIFICATION B-595-P-P33B

APPROVED FOR CONSTRUCTION

REVISION 0

ISSUE DATE 2-2-93

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B. E. Rittley for J. G. Kelly

Quality Assurance Manager

R. S. Poulter
R. S. Poulter

Project Director

Jan 1/27/93
Date

JAN 27, 1993
Date

1/27/93
Date

1/27/93
Date

1/27/93
Date

1/27/93
Date

1-27-93
Date

Date

FEB 2 1993

PROCESS SUPPORT VESSELS AND EQUIPMENT
VITRIFICATION BUILDING
SPECIFICATION B-595-P-P33B

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05066	Welding Specialty Equipment	0

DIVISION 13 - SPECIAL CONSTRUCTION

Section	Title	
13252	Precautions for Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys	0
13433	Pressure Vessels - Stainless Steel	0

DIVISION 14 - CONVEYING SYSTEMS

Section	Title	
14583	Cold Feed Agitators	0
14584W	Cold Feed Agitator	0

DIVISION 15 - MECHANICAL

Section	Title	
15139	Air Driven Diaphragm Pumps	0
15141	Centrifugal Pumps	0
15145	Sump Pumps	0
15148	Sealless Pumps	0
15196	Identification and Tagging Methods for Mechanical Equipment	0
15648	Plate Heat Exchangers	0
15649	Metering Pumps	0
15820	Vacuum Blowers	0
15821	Centrifugal Blowers	0
15894	Vibrating Filters	0
15896	Roughing Filters/HEPA Filters (Mechanical)	0
15898	HEGA Filters	0

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

Rev. 0

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DIVISION 17 - INSTRUMENTATION

Section Title

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17704	General Instrumentation Installation and Testing	0
17892	Frit Slurry Filter Local Panels	0
17893	Instruments Furnished with Mechanical Equipment	0
	Frit Slurry Filters	0

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U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 01730
OPERATION AND MAINTENANCE DATA
B-595-P-P33B-01730

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA	YES	<u> </u>	NO	<u>X</u>
QUALITY LEVEL	I	<u> </u>	II	<u>X</u>
SAFETY CLASS	1	<u> </u>	2	<u> </u>
			3	<u>X</u>
			4	<u> </u>

ORIGINATOR:

CHECKER:

J. R. Morey 01/26/93
J. R. Morey, Specification Writer Date

D. A. Buzzelli 1-26-93
D. A. Buzzelli, Lead Mech. Checker Date

APPROVED BY:

R. B. Erickson
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1-26-93
Date

Rev. 0

SECTION 01730
OPERATION AND MAINTENANCE DATA
B-595-P-P33B-01730

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**SECTION 01730
OPERATION AND MAINTENANCE DATA**

PART 1 GENERAL

1.1 SUBMISSION OF OPERATION AND MAINTENANCE DATA

Submit operation and maintenance (O&M) data which is specifically applicable to this contract and a complete and concise depiction of the provided equipment or product. Data containing extraneous information to be sorted through to find applicable instructions will not be accepted. Present information in sufficient detail to clearly explain user O&M requirements at the system, equipment, component, and subassembly level. Include an index preceding each submittal. Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.1.1 Package Content

For each product, system, or piece of equipment requiring submission of O&M data, submit the package required in the individual technical section. Package content shall be as required in the Paragraph 1.3, "Schedule of Operations and Maintenance Data Packages."

1.2 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES

1.2.1 Operating Instructions

Include specific instructions, procedures, and illustrations for the following phases of operation:

1.2.1.1 Safety Precautions

List personnel hazards and equipment or product safety precautions for all operating conditions.

1.2.1.2 Operator Prestart

Include requirements to set up and prepare each system for use.

1.2.1.3 Start-Up, Shutdown, and Post-Shutdown Procedures

Include a control sequence for each of these operations.

1.2.1.4 Normal Operations

Include control diagrams with data to explain operation and control of systems and specific equipment.

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1.2.1.5 Emergency Operations

Include emergency procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Include emergency shutdown instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance on emergency operations of all utility systems including valve locations and portions of systems controlled.

1.2.1.6 Operator Service Requirements

Include instructions for services to be performed by the operator such as lubrication, adjustments, and inspection.

1.2.1.7 Environmental Conditions

Include a list of environmental conditions (temperature, humidity, and other relevant data) which are best suited for each product or piece of equipment and describe conditions under which equipment should not be allowed to run.

1.2.2 Preventive Maintenance

Include the following information for preventive and scheduled maintenance to minimize corrective maintenance and repair.

1.2.2.1 Lubrication Data

Include lubrication data, other than instructions for lubrication in accordance with Paragraph 1.2.1.6, Operator Service Requirements.

1.2.2.2 Preventive Maintenance Plan and Schedule

Include manufacturer's schedule for routine preventive maintenance, inspections, tests and adjustments required to ensure proper and economical operation and to minimize corrective maintenance and repair. Provide manufacturer's projection of preventive maintenance man-hours on a daily, weekly, monthly, and annual basis.

1.2.3 Corrective Maintenance

Include manufacturer's recommendations on procedures and instructions for correcting problems and making repairs.

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1.2.3.1 Troubleshooting Guides and Diagnostic Techniques

Include step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.

1.2.3.2 Wiring Diagrams and Control Diagrams

Wiring diagrams and control diagrams shall be point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams number electrical and electronic wiring and pneumatic control tubing and the terminals for each type, identically to actual installation numbering.

1.2.3.3 Maintenance and Repair Procedures

Include instructions and list tools required to restore product or equipment to proper condition or operating standards.

1.2.3.4 Removal and Replacement Instructions

Include step-by-step procedures and list required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Instructions shall include a combination of text and illustrations.

1.2.3.5 Spare Parts and Supply Lists

Include lists of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays.

1.2.3.6 Corrective Maintenance Man-Hours

Include manufacturer's projection of corrective maintenance man-hours. Corrective maintenance that requires participation of the equipment manufacturer shall be identified and tabulated separately.

1.2.4 Appendices

Provide information specified in the preceding paragraphs pertinent to the maintenance or operation of the product or equipment. Include the following:

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1.2.4.1 Parts Identification

Provide identification and coverage for all parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing shall show the index, reference, or key number which will cross-reference the illustrated part to the listed part. Parts shown in the listings shall be grouped by components, assemblies, and subassemblies.

- A. Manufacturer's Standard Commercial Practice: The parts data may cover more than one model or series of equipment, components, assemblies, subassemblies, attachments, or accessories, such as a master parts catalog, in accordance with the manufacturer's standard commercial practice.
- B. Other Than Manufacturer's Standard Commercial Practice (MSCP): End item manufacturer may add a cross-reference to implement components' assemblies and parts requirements when implementation in manual form varies significantly from the style, format, and method of manufacturer's standard commercial practice. Use the format in the following example:

End Item Manufacturer's Alphanumeric Sequence	Actual Manufacturer's Name and MSCP	Actual Manufacturer Part No.
100001	John Doe & Co. 00000	2000002

1.2.4.2 Warranty Information

List and explain the various warranties and include the servicing and technical precautions prescribed by the manufacturers or contract documents to keep warranties in force.

1.2.4.3 Personnel Training Requirements

Provide information available from the manufacturers to use in training designated personnel to operate and maintain the equipment and systems properly.

1.2.4.4 Testing Equipment and Special Tool Information

Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components.

1.3 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

Furnish the O&M data packages specified in individual technical sections. The required information for each O&M data package is as follows:

1.3.1 Data Package

- A. Operating instructions
- B. Safety precautions
- C. Operation prestart
- D. Start-up, shutdown, and post shutdown
- E. Normal operations
- F. Emergency operations
- G. Operator Service Requirements
- H. Environmental conditions
- I. Preventative maintenance
- J. Lubrication data
- K. Preventive maintenance plan and schedule
- L. Corrective maintenance
- M. Troubleshooting guides and diagnostic techniques
- N. Wiring diagrams and control diagrams
- O. Maintenance and repair procedures and manhour requirements
- P. Removal and replacement instructions
- Q. Spare parts and supply list
- R. Parts identification
- S. Warranty information
- T. Personnel training requirements
- U. Testing equipment and special tool information

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PART 2 PRODUCTS

(Not Used)

PART 3 EXECUTION

(Not Used)

END OF SECTION

9413202-0553
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U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 05063
WELDING PRESSURE VESSELS
B-595-P-P33B-05063

APPROVED FOR CONSTRUCTION

REVISION NO. 0
ISSUE DATE 2-2-93

WAPA YES NO X
QUALITY LEVEL I II X
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

CHECKER:

A. Estrada 1/26/93
A. Estrada, Welding Engineer Date

D. A. Buzzelli 1-26-93
D. A. Buzzelli, Lead Disc. Checker Date

APPROVED BY:

R. B. Erickson
C. J. Divona Lead Discipline Engineer

1-26-93
Date

SECTION 05063
WELDING PRESSURE VESSELS
B-595-P-P33B-05063

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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>
A	WELD MAP
B	WELDING PROCEDURE SUMMARY

9413202.055

**SECTION 05063
WELDING PRESSURE VESSELS**

PART 1 GENERAL

1.1 SUMMARY

This specification section defines the welding, examination and testing requirements for shop fabrication of out-of-cell pressure vessels.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

**AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
Boiler and Pressure Vessel Code**

ASME Section II, Part C	1989 Material Specifications - Welding Rods, Electrodes, and Filler Metals
ASME Section V	1989 Nondestructive Examination
ASME Section VIII, Division 1	1989 Rules for Construction of Pressure Vessels
ASME Section IX	1989 Welding and Brazing Qualification

AMERICAN SOCIETY OF NONDESTRUCTIVE TESTING (ASNT)

ASNT SNT-TC-1A	1988 Recommended Practice - Personnel Qualification and Certification in Nondestructive Testing
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AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	1986 Standard Symbols for Welding, Brazing and Nondestructive Testing
AWS A3.0	1989 Welding Terms and Definitions
AWS D10.11	1987 Recommended Practices for Root Pass Welding of Pipe Without Backing
AWS QC1	1988 Standard for AWS Certification of Welding Inspectors

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1.3 RELATED REQUIREMENTS

Specification Section 13252 Precautions for the Fabrication,
Handling and Storage of Stainless
Steel and Nickel Alloys

1.4 DEFINITIONS

CMTR - Certified Material Test Report

NDE - Nondestructive Examination

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and
Data Requirements section of the Order/Subcontract.

1.6.1 Welding Procedure Specifications (ASME Form QW-482 or equivalent)
and Procedure Qualification Records (ASME Form QW-483 or
equivalent) shall be submitted for Buyer approval. This
requirement shall also pertain to purchased items contracted by
Seller. They shall be in accordance both with the requirements of
ASME Section IX and this specification section. Seller shall
review their contractor's procedures prior to submittal to verify
their conformance to the requirements of this specification
section.

1.6.2 Welder Performance Qualifications (ASME Form QW-484 or equivalent)
shall be submitted for Buyer review. This requirement shall also
pertain to purchased items contracted by Seller.

1.6.3 Certified Material Test Reports (CMTRs) for filler metal shall be
submitted for Buyer review.

1.6.4 Weld repair procedure shall be submitted for Buyer approval.

1.6.5 Final weld nondestructive examination (NDE) and inspection reports
shall be submitted for Buyer review. These shall include visual
inspection reports, NDE reports and radiography film.

1.6.6 Weld maps and weld procedure summary sheets shall be submitted for
Buyer approval. They shall specifically identify each weld joint,
welding procedure to be used and NDE requirements (sample form in
Attachments A and B).

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1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Weld filler materials shall be in accordance with ASME Section II, Part C.

2.1.2 Weld filler materials shall be used so that the principal elements in the deposited weld metal shall be of the same nominal composition as the base metal.

2.1.3 Solid wires for automatic welding processes shall contain the principal alloying elements required for the deposited weld metal. Welds deposited by the submerged arc process shall not derive any principal element from the flux. No alloy fluxes shall be allowed.

2.1.4 Fluxes that the flux manufacturer recommends for single-pass shall not be used for multiple-pass welds.

2.1.5 Submerged arc welding shall be performed using the same name brand flux and the same name brand of ASME classification wire as used for the procedure qualifications.

2.1.6 Storage and handling of electrodes, fluxes and other welding materials after shipping containers are opened shall be in accordance with Seller's filler material control procedure. This procedure shall be in accordance with the guidelines of ASME Section II, Part C and the filler metal manufacturer's recommendation.

2.1.7 Tack welds shall be made with the equivalent type of electrode filler wire that is used for the root pass.

2.2 FABRICATION AND MANUFACTURE

2.2.1 General Requirements

2.2.1.1 Fabrication to this specification section shall be in accordance with the requirements of ASME Section VIII, Division 1. Conformance to this specification section and authorization of Welding Procedure Specifications and Procedure Qualification

Records shall in no way relieve Seller of the responsibility to provide welds which are sound and suited to the services for which they are intended.

- 2.2.1.2 Welding and nondestructive test symbols shall be in accordance with AWS A2.4.
- 2.2.1.3 Welding terms and definitions shall be in accordance with AWS A3.0.
- 2.2.1.4 Cleanliness shall be maintained during welding. All stubs, rods, flux, slag and other foreign material shall be removed from the weld area.
- 2.2.1.5 Peening of welds is not permitted.
- 2.2.1.6 All weld spatter, burrs, etc., shall be ground to a smooth contour.
- 2.2.1.7 Arc strikes, weld starts and stops shall be confined to the weld joint. Arc strikes found outside the weld joint that are deeper than 1/16 inch shall be welded to fill depression and then ground to a smooth contour. Those less than 1/16 inch shall be ground to a smooth contour.
- 2.2.1.8 Fabrication aids, temporary supporting lugs, etc., that are removed by gouging or cutting shall not be cut closer than 1/8 inch from the vessel surface. The remaining material shall then be ground flush with the base metal. The ground area shall be inspected for possible cracks or porosity by liquid penetrant examination. Examination shall be in accordance with Paragraph 3.2.6.
- 2.2.1.9 Nozzles, lugs, support rings and similar items shall not be located on a weld seam unless unavoidable. Buyer authorization shall be required if any attachment is to be located on weld seam.
- 2.2.1.10 Where double welded butt joints cannot be utilized the root pass welds shall be made with the GTAW process. Back purging gas shall be used during welding. The purge shall be maintained until at least 0.250 inch depth of weld metal has been deposited or the weld joint is filled, whichever is less. Purging shall be in accordance with AWS D10.11.
- 2.2.1.11 Tack welds in open butt joints shall be feathered into surrounding material. Cracked tack welds shall be removed.

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2.2.2 Welding Qualifications

2.2.2.1 Welding Procedure Specifications, Procedure Qualification Records and Welder Performance Qualifications shall be in accordance both with ASME Section IX and this specification section.

2.2.2.2 Welds deposited by procedures differing from those authorized shall be rejected and completely removed at Seller's cost.

2.2.2.3 At the request of the Buyer, any welder shall be retested and requalified when the work of said welder creates a reasonable doubt as to the quality of his/her workmanship.

2.2.3 Acceptable Welding Processes

2.2.3.1 Welding may be achieved by any one or combination of the following welding processes:

<u>Welding Process</u>	<u>AWS Letter Designation</u>
Shielded Metal Arc Welding	SMAW
Manual and Automatic Gas Tungsten Arc Welding	GTAW
Automatic Submerged Arc Welding	SAW

2.2.3.2 Other welding processes such as Gas Metal Arc, Manual Submerged Arc and processes employing flux-cored electrodes require specific written authorization by the Buyer. Submit all pertinent data and intended application of said process for evaluation.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Weld joint preparation shall be made by mechanical means or thermal cutting. When thermal cutting is performed, the joint surfaces shall be ground to bright metal prior to welding. Oxy-fuel cutting of stainless steel is not acceptable.

3.1.2 Permanent backup strips are not permitted without specific written authorization from the Buyer. If temporary backup rings are used and then removed, the weld area shall be dressed and examined for cracks and other defects. Examination of the weld surfaces shall be performed visually and by the liquid penetrant method. Liquid penetrant examination shall be in accordance with Paragraph 3.2.6.

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- 3.1.3 To minimize the contamination of stainless steel the Seller shall follow the requirements of Specification Section 13252 prior to and after welding.
- 3.1.4 All surfaces to be welded shall be free of paint, oil, dirt, scale, oxides and other foreign materials detrimental to weld soundness.
- 3.1.5 Joint edges and adjacent surfaces to be welded shall be wire-brushed. They shall then be cleaned with an ethyl alcohol or acetone dampened lint-free cloth before welding begins.
- 3.1.6 Wire brushes shall be made of 300 Series austenitic stainless steel. Clearly mark mechanical cleaning tools such as grinding wheels, files, deburring tools and wire brushes. Marking shall identify tools to be used on stainless steel only.
- 3.1.7 Grinding shall be done in such a method that overheating of base and weld metal is minimized. Heat tint is an indication of overheating. Abrasive disks and abrasive flapper wheels are preferred over grinding disks or continuous-belt grinders.
- 3.2 **INSTALLATION, APPLICATION AND ERECTION**
- 3.2.1 All welds shall be made in accordance with Contract Drawings and Seller's fabrication drawings.
- 3.2.2 Flux, weld spatter and any slag shall be removed from each weld bead prior to depositing each succeeding pass.
- 3.2.3 Welding starts and stops in welds shall be held to a minimum. Each such stop shall be properly conditioned before continuing the welding. The use of starting and stopping plates is recommended where possible.
- 3.2.4 Each weld shall be continuously uniform in width and size through its full length. Welds shall be free of coarse ripples, grooves, overlap and undercut. Crevices and intermittent welds are not permitted because of increased chance of stress corrosion cracking.
- 3.2.5 **Preheat and Interpass Temperature Control**
- 3.2.5.1 For stainless steel the minimum preheat shall be 50°F. The maximum interpass temperature shall not exceed 350°F.

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3.2.6 Inspection and Nondestructive Examination (NDE)

3.2.6.1 General Requirement

Specific NDE shall be as noted on Contract Documents. NDE methods, acceptance criteria and additional general requirements shall be in accordance with the following subparagraphs. All NDE, except visual examination, shall be performed by personnel certified in accordance with ASNT SNT-TC-1A.

3.2.6.2 Inspection

- A. Seller's welding inspector shall be certified in accordance with AWS QC1 or equivalent authorized by Buyer.
- B. All weld inspection reports shall be maintained and submitted in accordance with Paragraph 1.6.

3.2.6.3 Visual Examination

- A. Visual examination shall be performed in accordance both with ASME Section V, Article 9 and this specification section.
- B. The welds to be examined, the evaluation of indications and the acceptance criteria shall be in accordance with ASME Section V, Article 9, Paragraphs T-950-1 and T-950-2, and ASME Section VIII, Division 1, Paragraph UW-35.
- C. Visual examination shall be performed on accessible surface of all completed welds.
- D. In addition to visual examination of completed welds, visual examination is required for all ground and blended welds.

3.2.6.4 Liquid Penetrant Examination

- A. Liquid penetrant examination procedures shall be in accordance with the requirements and methods specified in ASME Section V, Article 6.
- B. Penetrant materials shall meet the requirements of ASME Section V, Article 6, Paragraph T-625 for sulfur and halogen content regardless of the type of material to be examined.
- C. Liquid penetrant examination of welds shall include a band of base metal at least 1 inch wide on each side of the weld.
- D. The evaluation of indications and the acceptance criteria shall be in accordance with ASME Section VIII, Division 1, Appendix 8, Paragraphs 8.3 and 8.4 and Part UHA, Paragraph UHA-34.

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3.2.6.5 Radiographic Examination

- A. Radiographic examination procedures and techniques shall be in accordance with ASME Section V, Article 2.
- B. The acceptance criteria and extent of examination shall be in accordance with ASME Section VIII, Division 1, Paragraph UHA-33.

3.2.6.6 Ultrasonic Examination (UT)

- A. Ultrasonic examination procedures and techniques shall be in accordance with the requirements and methods specified in ASME Section V, Article 5.
- B. The acceptance criteria shall be in accordance with ASME Section VIII, Division 1.

3.3 FIELD QUALITY CONTROL

(Not Used)

3.4 ADJUSTMENTS

3.4.1 Weld Repairs

3.4.1.1 All weld repairs shall be performed in accordance with the approved weld repair procedure.

3.4.1.2 Unacceptable indications shall be completely removed by chipping, gouging, grinding or other authorized methods (for the type of material being repaired) to clean, sound metal. The excavated areas shall be examined by the liquid penetrant method to assure complete removal of defects. Liquid penetrant examination shall be in accordance with Paragraph 3.2.6.

3.4.1.3 The repaired areas shall be reexamined using the same inspection procedures by which the defect was originally detected along with all other inspection called out for the particular weld.

3.4.1.4 Two repair attempts will be allowed on any one defective area. No further repair attempts shall be carried out without the authorization of Buyer.

3.5 CLEANING

(Not Used)

3.6 PROTECTION

(Not Used)

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3.7 DEMONSTRATION

(Not Used)

3.8 SCHEDULES

(Not Used)

END OF SECTION

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ATTACHMENT A
WELD MAP

Buyer P.O. No.

Item No.

Buyer Weld Specification No.

1. Draw a single line sketch of the pressure-retaining parts.
2. Identify each qualified welding procedure.

SKETCH

Seller
Address
Buyer PO#

This Form Completed By _____

Telephone No. _____

Revisions _____

Date _____

Buyer Welding Eng. Review Block

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ATTACHMENT B
WELD PROCEDURE SUMMARY DATA

<u>Space No.</u>	<u>Action to be Taken</u>
1	Enter the Buyer's Purchase Order number. A separate summary must be completed for each P.O. and suborder.
2	Enter the Buyer's item number(s). The summary sheet must reflect all items of similar construction that will have common welding procedures. Items of markedly different materials or methods of Manufacture should be entered on separate WPS's.
3	Enter Seller's name.
4	Enter Seller's shop location where work will be performed.
5	Enter date summary is compiled.
6	Enter Buyer serial number and revision (Buyer's use only).
7	Enter Welding Procedure Specification (WPS) number.
8	Enter Procedure Qualification Record (PQR) number(s) supporting the WPS.
9	Enter the welding process(es) used in performing (PQR).
10	Enter type of joint as referenced in Legend. Where (E) is used, state type of joint or overlay in space 17.
11	Enter ASME-ASTM materials to be used in fabrication.
12	Enter base metal thickness range qualified by PQR.
13	Enter postweld heat treatment information in appropriate box.
14	Enter other pertinent information in this space. Such as impacts, etc.
15	Enter current review status of weld procedure (Buyer's use only).
16	Enter date of current review status of weld procedure (Buyer's use only).
17	Enter any special design or process information regarding the item of construction in this box.

ATTACHMENT B
Page 3 of 3

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 05066
WELDING SPECIALTY EQUIPMENT
B-595-P-P33B-05066

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA YES NO X
QUALITY LEVEL I II X
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

CHECKER:

A. Estrada 1/26/93
A. Estrada, Welding Engineer Date

D. A. Buzzelli 1-26-93
D. A. Buzzelli, Lead Disc Checker Date

APPROVED BY:

R. B. Erickson
C. J. Divona Lead Discipline Engineer

1-26-93
Date

SECTION 05066
WELDING SPECIALTY EQUIPMENT
B-595-P-P33B-05066

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**SECTION 05066
WELDING SPECIALTY EQUIPMENT**

PART 1 GENERAL

1.1 SUMMARY

This specification section defines the welding, examination and testing requirements for shop fabrication of stainless steel specialty equipment in non-radioactive service.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A744/A744M 1991 Standard Specification for
Casting, Iron-Chromium-Nickel,
Corrosion Resistant, for Severe Service

**AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
Boiler and Pressure Vessel Codes**

ASME Section II, 1989 Material Specifications -
Part C Welding Rods, Electrodes, and Filler
Metals

ASME Section V 1989 Nondestructive Examination

ASME Section VIII, 1989 Rules for Construction of Pressure
Division 1 Vessels

ASME Section IX 1989 Welding and Brazing Qualification

AMERICAN SOCIETY OF NONDESTRUCTIVE TESTING (ASNT)

ASNT SNT-TC-1A 1988 Recommended Practice - Personnel
Qualification and Certification in
Nondestructive Testing

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4 1986 Standard Symbols for Welding,
Brazing and Nondestructive
Examination

AWS A3.0 1989 Welding Terms and Definitions

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AWS D10.11 1987 Recommended Practices for Root
Pass Welding of Pipe Without
Backing

AWS QC1 1988 Standard for AWS Certification
of Welding Inspectors

1.3 RELATED REQUIREMENTS

Specification Section 13252 Precautions for Fabrication,
Handling and Storage of Stainless
Steel and Nickel Alloys

1.4 DEFINITIONS

CMTR - Certified Material Test Report

NDE - Nondestructive Examination

1.5 SYSTEMS DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and
Data Requirements section of the Order/Subcontract.

1.6.1 Welding Procedure Specifications (ASME Form QW-482 or equivalent)
and Procedure Qualification Records (ASME Form QW-483 or
equivalent) shall be submitted for Buyer approval. This
requirement shall also pertain to purchased items contracted by
Seller. They shall be in accordance both with the requirements of
ASME Section IX and this specification section. Seller shall
review their contractor's procedures prior to submittal to verify
their conformance to the requirements of this specification
section.

1.6.2 Welder Performance Qualifications (ASME Form QW-484 or equivalent)
shall be submitted for Buyer review. This requirement shall also
pertain to purchased items contracted by Seller.

1.6.3 Certified Material Test Reports (CMTRs) shall be submitted for
Buyer review.

1.6.4 Weld repair procedures shall be submitted for Buyer approval.

1.6.5 Final weld nondestructive examination (NDE) and inspection reports
shall be submitted for Buyer review. These shall include visual
inspection reports, NDE reports and radiographic film.

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1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Matching weld filler materials shall be in accordance with ASME Section II, Part C.

2.1.2 Weld filler materials shall be used so that the principal elements in the deposited weld metal shall be of the same nominal composition as the base metal.

2.1.3 Solid wires for automatic welding processes shall contain the principal alloying elements required for the deposited weld metal. Welds deposited by the submerged arc process shall not derive any principal alloying elements from the flux. Alloy flux shall not be used.

2.1.4 Fluxes that the flux manufacturer recommends for single-pass shall not be used for multiple-pass welds.

2.1.5 Submerged arc welding shall be performed using both the same name brand flux and the same name brand of ASME classification wire as used for the procedure qualifications.

2.1.6 Storage and handling of electrodes, fluxes and other welding materials after shipping containers are opened shall be in accordance with Seller's filler materials control procedure. This procedure shall be in accordance with the guidelines of ASME Section II, Part C and the filler metal manufacturer's recommendations.

2.1.7 Tack welds shall be made with the equivalent type of filler wire that is used for the root pass.

2.1.8 Temporary backup rings or strips, when required on the Contract Drawings, shall be of the same nominal composition as the base material.

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2.2 FABRICATION AND MANUFACTURE

2.2.1 General Requirements

2.2.1.1 Fabrication to this specification section shall be in accordance with the requirements of ASME Code Section VIII, Division 1 whether or not the equipment will be code stamped. Conformance to this specification section and authorization of Welding Procedure Specifications and Procedure Qualification Records shall in no way relieve Seller of the responsibility to provide welds which are sound and suited to the services for which they are intended.

2.2.1.2 Welding and nondestructive test symbols shall be in accordance with AWS A2.4.

2.2.1.3 Welding terms and definitions shall be in accordance with AWS A3.0.

2.2.1.4 Cleanliness shall be maintained during welding. All stubs, rods, flux, slag and other foreign material shall be removed from the weld area.

2.2.1.5 All weld spatter, burrs, etc. shall be ground to a smooth contour.

2.2.1.6 Where double welded butt joints cannot be utilized, the root pass welds shall be made by the GTAW process with back purging gas. The purge shall be maintained until at least 0.250 inch depth of weld metal has been deposited or the weld joint is filled, whichever is less. Purging shall be in accordance with AWS D10.11.

2.2.1.7 Arc strikes, weld starts and stops shall be confined to the weld joint. Arc strikes found outside the weld joint that are deeper than 1/16 inch shall be welded to fill depression and then ground to a smooth contour. Those less than 1/16 inch shall be ground to a smooth contour.

2.2.1.8 Tack welds in open butt joints shall be feathered into surrounding material. Cracked tack welds shall be removed.

2.2.2 Welding Qualifications

2.2.2.1 Welding procedures, welders, welding operators and tackers shall be qualified in accordance with ASME Section IX.

2.2.2.2 At the request of the Buyer, any welder shall be retested and requalified when the work of said welder creates a reasonable doubt as to the quality of his/her workmanship.

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- 2.2.2.3 The format of welding procedure specifications, welding procedure qualification records and nondestructive inspection reports shall be in accordance with ASME Section IX, Appendix A.
- 2.2.2.4 Welding shall not start until Welding Procedure Specifications including Procedure Qualification Records and Weld Repair Procedure are returned to Seller from Buyer with authorization to proceed. Weld performed by procedures differing from those authorized, or by non-qualified personnel, are subject to complete removal.

2.2.3 Acceptable Welding Processes

- 2.2.3.1 Welding may be achieved by any one or combination of the following welding processes:

<u>Welding Process</u>	<u>AWS Letter Designation</u>
Shielded Metal Arc Welding	SMAW
Flux-Cored Arc Welding (with Shielding Gas)	FCAW
Manual and Automatic Gas Tungsten Arc Welding	GTAW
Gas Metal Arc Welding (Spray Transfer)	GMAW
Automatic Submerged Arc Welding	SAW

- 2.2.3.2 Other welding processes such as Manual Submerged Arc and Gas Metal Arc (Short Circuit Transfer) require specific written authorization by the Buyer's Welding Engineer. Submit all pertinent data and intended application of said process for evaluation.

PART 3 EXECUTION

3.1 PREPARATION

- 3.1.1 Weld joint preparation shall be made by machining, grinding or thermal cutting. When thermal cutting is performed the joint surfaces shall be ground to bright metal prior to welding. Oxy-fuel cutting of stainless steel is not acceptable.
- 3.1.2 Permanent backup strips or backing rings are not permitted without specific written authorization from Buyer. If temporary backup strips are used and then removed, the weld area shall be dressed and liquid penetrant examined for cracks and other defects.

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Liquid penetrant examination shall be in accordance with Paragraph 3.2.6.

- 3.1.3 To minimize the contamination of stainless steel Seller shall follow the requirements of Specification Section 13252 prior to and after welding.
- 3.1.4 All surfaces to be welded shall be free of paint, oil, dirt, scale, oxides and other foreign materials detrimental to weld soundness.
- 3.1.5 For stainless steel joint edges and adjacent surfaces to be welded shall be wire-brushed. They shall then be cleaned with an ethyl alcohol or acetone dampened lint-free cloth before welding begins.
- 3.1.6 Wire brushes used on stainless steel welds shall be made of 300 Series stainless steel. Clearly mark mechanical cleaning tools used on stainless steel such as grinding wheels, files, deburring tools and wire brushes. Marking shall identify tools to be used on stainless steel only.
- 3.1.7 Grinding shall be done in such a method that overheating of base and weld metal is minimized. Heat tint is an indication of over heating. Abrasive disks and abrasive flapper wheels are preferred over grinding disks or continuous-belt grinders.
- 3.2 **INSTALLATION, APPLICATION AND ERECTION**
- 3.2.1 All welds shall be made in accordance both with Contract Drawings and Seller's fabrication drawings.
- 3.2.2 Preheat and Interpass Temperature Control
- 3.2.2.1 For austenitic stainless steel the minimum preheat shall be 50°F.
- 3.2.2.2 Interpass temperature for austenitic stainless steel shall not exceed 350°F.
- 3.2.3 Flux, weld spatter and any slag shall be removed from each weld bead prior to depositing each succeeding pass.
- 3.2.4 Welding starts and stops in welds shall be held to a minimum. Each such stop shall be properly conditioned before continuing the welding. The use of starting and stopping plates is recommended where possible.
- 3.2.5 Each weld shall be continuously uniform in width and size through its full length. Welds shall be free of coarse ripples, grooves, overlap and undercut. Crevices and intermittent welds are not permitted because of increased chance of stress corrosion cracking.

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3.2.5.1 All required finish machining shall be done after heat treatment.

3.2.6 Inspection and Nondestructive Examination

Specific nondestructive examination shall be performed in accordance with Seller's fabrication drawings. NDE methods, acceptance criteria and additional general requirements shall be in accordance with the following subparagraphs. All NDE, except visual examination, shall be performed by personnel certified in accordance with ASNT SNT-TC-1A.

3.2.6.1 Inspection

- A. Seller's welding inspector shall be certified in accordance with AWS QC1 or equivalent authorized by Buyer.
- B. All weld inspection reports shall be submitted in accordance with Paragraph 1.6.

3.2.6.2 Visual Examination

- A. Visual examination shall be performed in accordance both with ASME Section V, Article 9 and this specification section.
- B. Visual examination shall be performed on an accessible surface of all completed welds.
- C. The welds to be examined, the evaluation of indications and the acceptance criteria shall be in accordance with ASME Section V, Article 9, Paragraphs T-950-1 and T-950-2 and ASME Section VIII, Division 1, Paragraph UHA-34.

3.2.6.3 Liquid Penetrant Examination

- A. Liquid penetrant examination procedures shall be in accordance with the requirements and methods specified in ASME Section V, Article 6.
- B. Penetrant materials shall meet the requirements of ASME Section V, Article 6, Paragraph T-625, for sulfur and halogen content regardless of the type of material to be examined.
- C. Liquid penetrant examination of welds shall include a band of base metal no less than 1 inch wide on each side of the weld. Liquid penetrant examination shall be performed after welds have been ground and visually examined.

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- D. The evaluation of indications and the acceptance criteria shall be in accordance with ASME Section VIII, Division 1, Appendix 8, Paragraphs 8.3 and 8.4.

3.2.6.4 Ultrasonic Examination

- A. Ultrasonic examination procedures shall be in accordance with the requirements and methods specified in ASME Section V, Article 5.
- B. The acceptance criteria shall be in accordance with ASME Section VIII, Division 1, Appendix 12, Paragraph 12.3.

3.2.6.5 Radiographic Examination

- A. Radiographic examination procedures and techniques shall be in accordance with ASME Section V, Article 2.
- B. The extent of examination acceptance criteria shall be in accordance with ASME Section VIII, Division 1, Paragraph UW-51.
- C. Composite viewing of double film exposure is not permitted unless prior acceptance is granted by Buyer for each application.

3.3 FIELD QUALITY CONTROL

(Not Used)

3.4 ADJUSTMENTS

3.4.1 Weld Repairs

- 3.4.1.1 All weld repairs shall be performed in accordance with the approved weld repair procedures.

- 3.4.1.2 Unacceptable indications shall be completely removed by chipping, gouging, grinding or other authorized methods (for the type of material being repaired) to clean, bright metal. The excavated areas shall be examined by the liquid penetrant method to assure complete removal of defects. Liquid penetrant examination shall be in accordance with Paragraph 3.2.6.

- 3.4.1.3 The repaired areas shall be reexamined using the same inspection procedures by which the defect was originally detected and all other inspection called out for the particular weld.

- 3.4.1.4 Two repair attempts will be allowed on any one defective area. No further repair attempts shall be carried out without the authorization of Buyer.

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3.4.1.5 For stainless steel casting, prior Buyer approval of major weld repair is required. Major weld repair shall be in accordance with ASTM A744/A744M.

3.5 CLEANING

(Not Used)

3.6 PROTECTION

(Not Used)

3.7 DEMONSTRATION

(Not Used)

3.8 SCHEDULES

(Not Used)

END OF SECTION

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U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 13252
PRECAUTIONS FOR FABRICATION, HANDLING AND STORAGE
OF STAINLESS STEEL AND NICKEL ALLOYS
B-595-P-P33B-13252

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA YES NO X
QUALITY LEVEL I II X
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

CHECKER:

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SECTION 13252
PRECAUTIONS FOR FABRICATION, HANDLING AND STORAGE
OF STAINLESS STEEL AND NICKEL ALLOYS
B-595-P-P33B-13252

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SECTION 13252
PRECAUTIONS FOR FABRICATION, HANDLING AND STORAGE
OF STAINLESS STEEL AND NICKEL ALLOYS

PART 1 GENERAL

1.1 SUMMARY

This specification section defines the requirement for handling, fabrication, shipment and storage of stainless steel and nickel alloys to minimize the risk of contamination.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A380	1978 Standard Practice for Cleaning and Descaling Stainless Steel Parts, Equipment, and Systems
ASTM D129	1991 Standard Test Method for Sulfur in Petroleum Products (General Bomb Method)
ASTM D808	1991 Standard Test Method of Chlorine in New and Used Petroleum Products (Bomb Method)
ASTM D1552	1990 Standard Test Method for Sulfur in Petroleum Products (High-Temperature Method)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME N45.2.1	1980 Cleaning of Fluid Systems and Associated Components for Nuclear Power Plants
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Boiler and Pressure Vessel Code

ASME Section V	1989 Nondestructive Examination
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CODE OF FEDERAL REGULATIONS (CFR)

40 CFR, Chapter 1 Part 143	1990 National Secondary Drinking Water Regulations
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1.3 RELATED REQUIREMENTS

(Not Used)

1.4 DEFINITIONS

- MIC - Microbiological Influenced Corrosion
ppm - Parts Per Million
SCC - Stress Corrosion Cracking

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirement section of the Order/Subcontract.

- 1.6.1 Seller's procedure for handling, cleaning, isolation and storage of stainless steel and nickel alloys. These procedures shall be submitted for Buyer approval.
- 1.6.2 Material safety data sheet shall be submitted for materials that are not intended to be removed after fabrication. Examples of these materials are: lubricants, thread compound, nondestructive examination materials, etc. Submit for Buyer review.
- 1.6.3 Seller's procedure for drying of equipment shall be submitted for Buyer approval. The procedure shall identify the means of verifying that all water has been dried from pockets and low points after hydrostatic testing.
- 1.6.4 Biocide water treatment procedure shall be submitted for Buyer approval.
- 1.6.5 Water chemistry and biocide material data sheet shall be submitted for Buyer approval. This information shall be submitted prior to hydrostatic testing.
- 1.6.6 Procedure for the isolation and separation of stainless steel wire brushes and grinding material shall be submitted for Buyer approval.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- 2.1.1 All limitations specified, e.g., percent, parts per million (ppm) etc. are to be by weight.
- 2.1.2 All consumables and materials used during fabrication shall meet the following general requirements unless addressed in more detail in this specification section:
- 2.1.2.1 Maximum chloride content shall be 250 ppm.
- 2.1.2.2 Maximum sulfur content shall be 1 percent.
- 2.1.2.3 Low melting point elements (such as cadmium, lead, mercury, tin and zinc) shall not be added.
- 2.1.3 Carbon Steel Contamination
- 2.1.3.1 Tools and equipment used to cut, form and handle stainless steel and nickel alloys shall be in accordance with one of the following requirements:
- A. Tools and equipment shall either be hardened tool steel or chrome-plated steel.
 - B. Surfaces of non-stainless steel tools and equipment which come into contact with stainless steel shall be covered either with paper, plastic or stainless steel sheet.
- 2.1.3.2 Grinding equipment and stainless steel wire brushes previously used on carbon steel shall not be used on stainless steel and nickel alloys.
- 2.1.3.3 Temporary attachments for welding or fabrication shall be of a similar grade material (e.g., 300 series stainless steel shall be used for a temporary attachment to 304L stainless steel) to the pressure component.
- 2.1.3.4 If scaffolding or ladders are used during fabrication, the contact surfaces at the stainless steel or nickel alloy interface shall be protected either by wood or plastic. No direct contact shall be permitted.
- 2.1.3.5 Areas used for fabrication of stainless steel and nickel alloys shall be separate from carbon steel fabrication areas. These areas shall be kept free of carbon steel shavings and grinding dust.
- 2.1.3.6 Where it is not possible to provide protection from carbon steel, the component shall be chemically cleaned to dissolve any carbon steel which may be embedded in the stainless steel or nickel

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alloy. The acceptable amount of contamination and cleaning requirement shall be in accordance with Paragraph 2.1.3.10.

2.1.3.7 Non-metallic slings shall be used when safe to do so. Lifting with carbon steel chains from lifting lugs is acceptable.

2.1.3.8 Carbon steel strapping material used for shipping shall not contact stainless steel or nickel alloy equipment or piping.

2.1.3.9 Walking directly upon stainless steel surfaces shall be prohibited where possible. Surfaces upon which walking access is required shall be protectively covered.

2.1.3.10 Acceptable Carbon Steel Contamination

Scattered areas of carbon steel contamination (as evident by rust) are permissible provided the aggregate area does not exceed 2 sq. in. in any 1 sq. ft. area. Carbon steel contamination shall be verified in accordance with ASTM A380.

Surfaces that are found to be contaminated with carbon steel shall be restored. Mechanical and chemical descaling is acceptable. Cleaning shall be performed in accordance with ASTM A380.

2.1.4 Wrapping and Protective Covering Materials

2.1.4.1 No chloride restriction shall apply to wrapping and protective covering material (such as polyethylene and polyvinyl chloride (PVC) films) when used for packaging or storage purposes. PVC caps, plugs and packaging material shall not be reused.

2.1.4.2 No chloride restriction shall apply to pressure-sensitive tapes or adhesive-backed tapes. Pressure-sensitive tapes or adhesive-backed tapes shall not be used within 12 inches of any area where local heating or welding may increase the metal temperature to 180°F or higher.

2.1.4.3 Where tape is used during welding for back purging, the tape shall be of a low-chloride (less than 250 ppm) type (Stockwell Rubber Company G-568 or equal).

2.1.4.4 After pressure-sensitive and adhesive-backed tapes are no longer required they shall be removed. Any remaining residual adhesive shall be removed. Acetone shall be used.

2.1.5 Grinding Discs, Abrasive Discs, Brushes and Material Removal Tools

2.1.5.1 Grinding discs, abrasive discs and brushes shall be designated for use on stainless steel and nickel base alloys. These materials shall not have been previously used on carbon steel, low alloy steels or nonferrous metals and their alloys.

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- 2.1.5.2 Grinding discs, abrasive discs and belts shall be of resin bonded alumina, silicon carbide or zirconium carbide. Sulfurized compounds shall not be used as a bonding material.
- 2.1.5.3 Only 300 series stainless steel brushes shall be used on stainless steel and nickel base alloys.
- 2.1.5.4 All material removal and cleaning tools shall be marked to identify that they are to be used on stainless steel and nickel alloys only.
- 2.1.6 Nondestructive Examination Materials
- 2.1.6.1 Sulfur and halogen content of liquid penetrant materials shall be in accordance with the requirements of ASME Section V, Article 6, T-625.
- 2.1.7 Cleaning Fluids
- Chlorinated hydrocarbon solvents may be used for stainless steel cleaning provided they are analyzed for total residual chlorine and sulfur. The analysis process is as follows:
- A. Select and weigh a glass Petri dish of 150mm nominal diameter. Note the weight.
 - B. Pour a 100 gram sample of the solvent into the Petri dish.
 - C. Heat the sample for 60 minutes. The heating temperature shall be between 194°F and 212°F, inclusive.
 - D. Weigh the Petri dish again. Subtract the weight noted in Step A from the new weight. This is the weight of the solvent residue.
 - 1) If the residue is less than 0.005 grams, the solvent is acceptable. No further analysis is required.
 - 2) If the residue weight is 0.005 grams or more, repeat Steps A through C. Test the residue in accordance with ASTM D129 or ASTM D1552 for sulfur content. Test the residue in accordance with ASTM D808 for halogen content.

The sulfur or chlorine content shall not exceed 1 percent of this residue by weight in any case.

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2.2 FABRICATION AND MANUFACTURE

2.2.1 Hydrostatic Test Water Quality

The intent of the following guidelines is to minimize the risk of chloride stress corrosion cracking (SCC) and microbiological influenced corrosion (MIC).

2.2.2 Water quality shall meet the following requirements for equipment that can be drained and completely dried or when specified by the Contract Documents.

2.2.2.1 Water used for testing shall be clean, filtered, chlorinated water. The free residual chlorine content of this water shall not be more than 0.1 ppm. It shall be in accordance with the following water chemistry and requirements:

- A. pH at 77°F shall be 5.5 to 8.0.
- B. Chloride content shall be less than 250 ppm.
- C. Fluoride content shall be less than 5 ppm.
- D. Sulfide content shall be less than 1 ppm.
- E. Total dissolved solids shall be less than 500 ppm.
- F. Treated with a biocide for the specific normal population of bacteria.

Potable water which meets the Code of Federal Regulations 40 CFR, Chapter 1, Part 143 requirements should satisfy these chemistry limits.

The test water shall be analyzed before equipment is filled. The water's free residual chlorine content shall be determined.

2.2.2.2 Test water and equipment surface temperature shall not exceed 140°F at any time during hydrostatic test or drying operations. If a temperature in excess of 140°F is necessary to dry equipment, deionized water shall be used. Deionized water shall meet the requirements of Paragraph 2.2.3.

2.2.2.3 Equipment shall be completely drained and dried within 48 hours of hydrostatic testing. Acceptable methods of drying include mopping, wiping or blow drying with cool (less than 140°F) nitrogen. Seller shall submit a drying procedure in accordance with Paragraph 1.6.3.

2.2.3 Deionized water shall be used for hydrostatic testing of equipment that can only be dried through evaporation or when specified in Contract Documents. The water and methods shall be in accordance with the following paragraphs:

2.2.3.1 Deionized water shall meet the following requirements:

- A. pH at 77°F shall be 5.5 to 8.0.
- B. Chloride content shall be less than 1 ppm.
- C. Fluoride content shall be less than 1 ppm.
- D. Sulfide content shall be less than 1 ppm.
- E. Conductivity at 77°F shall not exceed 3 micromho/cm.
- F. Silica content shall not exceed 0.05 ppm.
- G. Total suspended solids shall not exceed 3 ppm.
- H. Treated with a biocide for the specific normal population of bacteria.

Steam condensate or demineralized water should satisfy the above requirements. The above water chemistry requirements are in accordance with ASME N45.2.1.

The test water shall be analyzed before equipment is filled.

2.2.3.2 All equipment shall be sealed and maintained in clean condition once testing is complete.

2.2.3.3 Any hydrostatic test condition or procedure not addressed by the above paragraphs shall be submitted for Buyer approval prior to the start of testing.

2.2.4 Extended Hydrostatic Test

2.2.4.1 If equipment is subjected to extended hydrostatic test or wet layup condition (greater than 72 hours) the test water shall be analyzed for microbiological contamination. An acceptable biocide test kit shall be used (Bioindustrial Technologies Incorporated - MICKITTM or equal).

2.2.4.2 If necessary, the water shall be treated on a daily basis with a biocide to minimize the risk of microbiological contamination. Examples of acceptable biocides are chlorine (0.2 ppm) and hydrogen peroxide. Seller shall select the proper biocide according to the analyzed water chemistry. Seller shall submit a material safety data sheet on the intended biocide.

2.2.5 Cleaning Requirements

All surfaces to be welded shall be free of paint, oil, grease, dirt and other foreign materials detrimental to the weld soundness. An area 4 inches wide minimum on each side of weld joint shall be cleaned. Acceptable cleaning methods shall be mechanical or chemical methods in accordance with ASTM A380.

PART 3 EXECUTION

3.1 PREPARATION

(Not Used)

3.2 INSTALLATION, APPLICATION AND ERECTION

3.2.1 After welding all foreign materials such as flux, anti-spatter compound, slag and spatter shall be removed. Removal can be accomplished either by mechanical or chemical methods.

3.2.2 Heat tint (dark blue coloring) and scale shall be permitted on nonprocess side of weld joint. Light heat tint (straw or gold colored) shall be permitted on the process side of weld joint. When required, heat tint and scale can be removed either by mechanical or chemical descaling methods. For mechanical descaling, precleaning and postcleaning is required.

3.2.3 Liquid penetrant and ultrasonic examination materials shall be completely removed from surface after examination. Removal shall be in accordance both with manufacturer's recommendation and this specification section.

3.3 FIELD QUALITY CONTROL

(Not Used)

3.4 ADJUSTMENTS

(Not Used)

3.5 CLEANING

(Not Used)

3.6 PROTECTION

(Not Used)

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3.7 **DEMONSTRATION**

(Not Used)

3.8 **SCHEDULES**

(Not Used)

END OF SECTION

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U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 13433
PRESSURE VESSELS - STAINLESS STEEL
B-595-P-P33B-13433


APPROVED FOR CONSTRUCTION


REVISION 0
ISSUE DATE 2-2-93

WAPA YES NO X
QUALITY LEVEL I II X
SAFETY CLASS 1 2 3 X 4


ORIGINATOR:

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M. C. Sanvictores, Vessel Engineer Date

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D. A. Buzzelli, Lead Disc. Checker Date

APPROVED BY:


C. J. Divona Lead Discipline Engineer

1-26-93
Date

SECTION 13433
PRESSURE VESSELS - STAINLESS STEEL
B-595-P-P33B-13433

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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>
A	PRESSURE VESSEL MATERIAL RECORD
B	FLANGE BOLT HOLE ORIENTATION
C	VESSEL TOLERANCES
D	LIST OF CONTRACT DRAWINGS

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SECTION 13433
PRESSURE VESSELS - STAINLESS STEEL

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the minimum requirements for the design, fabrication, inspection and testing of stainless steel vessels and appurtenances.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B16.5 1988 Pipe Flanges and Flanged Fittings

ANSI Y14.5M 1982 Dimensioning and Tolerancing

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A380 1988 Standard Practice for Cleaning and
Descaling Stainless Steel Parts,
Equipment, and Systems

ASTM A480/A480M 1991 Standard Specification for General
Requirements for Flat-Rolled Stainless and
Heat-Resisting Steel Plate, Sheet, and
Strip

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
Boiler and Pressure Vessel Code

ASME Section II, 1989 Material Specification-Ferrous
Part A Materials

ASME Section VIII, 1989 Rules for Construction of
Division 1 Pressure Vessels

UNIFORM BUILDING CODE (UBC)

UBC 1988 Uniform Building Code

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1.3 RELATED REQUIREMENTS

Specification Section 05063 Welding Pressure Vessels

Specification Section 13252 Precautions for Fabrication,
Handling and Storage of Stainless
Steel and Nickel Alloys

CONTRACT DRAWINGS

Drawings as listed in Attachment D

1.4 DEFINITIONS

CMTR - Certified Material Test Report
DP - Design Pressure
MAWP - Maximum Allowable Working Pressure
NDE - Nondestructive Examination

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and
Data Requirements section of the Order/Subcontract.

1.6.1 Shop Drawings

- A. Dimensional details with applicable tolerances in accordance
with ANSI Y14.5M.
- B. Detailed bill of materials.
- C. General arrangement, assembly or outline drawings. These
drawings shall include the following information:
 - 1) ASME code edition and addenda.
 - 2) Coincident design pressure and temperature to be
stamped on the nameplate.
 - 3) Hydrostatic test pressure in psig.
 - 4) Basis for the calculated test pressure and the
limiting part.
 - 5) The vessel nameplate and all its markings.
 - 6) Corrosion allowance and location.

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- 7) Welded joint efficiency.
 - 8) Vessel name and equipment number.
 - 9) Standards, specifications and welding procedures.
 - 10) Listing of additional drawings.
 - 11) Requirements for nondestructive examination (NDE).
 - 12) Details of weld preparations and location of all circumferential and longitudinal weld seams.
 - 13) Cleaning, surface preparation and labeling requirements.
 - 14) Total fabricated weight of vessels, in pounds (round up to 3 significant figures or to hundreds of pounds).
 - 15) Vessel's center of gravity.
- D. Vessel elevation. This elevation shall indicate shell thickness, head thickness, shell-to-head transition and vessel supports.
- E. Lifting lug calculations and lifting lug reinforcement to vessels.
- F. Details of internal appurtenances, weld details, reinforcements, dimensions, finishes and applicable tolerances.
- G. Details for parts. These shall show the following additional information:
- 1) Material of construction. This shall include nominal and finished minimum thicknesses.
 - 2) Details of all weld joint preparation, applicable weld procedure number and NDE requirements.

1.6.2 ASME Code Documents and Special Requirements

Documents submitted to Buyer pertaining to ASME code certification, material and quality control records shall include the following:

- A. Hydrostatic test pressure chart for each vessel.
- B. Photograph of the actual nameplate for each vessel.

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- C. Pressure vessel material record which shall be completed for each vessel (refer to Attachment A). This record shall include:
- 1) An outline sketch of the vessel or an equivalent method of identification. This shall show the location of the principal pressure-retaining parts (shells and heads).
 - 2) The primary material record for all pressure-retaining parts made from plate, any nonpressure part required to be made from same plate material as the shell, seamless pipe used as a shell or sump and any pressure-retaining part whose material specification does not provide for the marking of each mill product piece [see ASME Section VIII, Division 1, Paragraph UG-93(a)(3)].
 - 3) The miscellaneous material record. This shall list the complete material specification designation when the material specification of a pressure-retaining part provides for the marking of each piece [see ASME Section VIII, Division 1, Paragraph UG-93(a)(2)] and for all nonpressure-retaining parts not listed in the primary material records.
 - 4) The "Pressure Vessel Material Record" (Attachment A) form shall be signed by an authorized representative of the vessel manufacturer's quality control department.
- D. Seller shall include two copies of the records of inspections and tests performed by Seller with each shipment of article(s). These shall include records of the results of each inspection and test performed.
- E. Certified Material Test Reports (CMTRs) shall be submitted in accordance with Paragraph 2.1.2.I.

1.6.3 Design Calculations

Seller shall be responsible for the complete design of the pressure vessel. Seller shall submit appropriate calculations that demonstrate the adequacy of the design to resist the design loadings specified in Paragraph 2.1.3 in accordance both with ASME Section VIII, Division 1 and this specification section.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

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1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

- A. Site Elevation 714 feet above sea level
- B. Barometric Pressure 14.3 psia
- C. Outside Design Temperature
 - 1) Maximum Design Temperature 110°F
 - 2) Minimum Design Temperature -20°F
 - 3) Wet Bulb Design Temperature 68°F
- D. Operating Environment
 - 1) Normal Temperature 60°F to 104°F
 - 2) Maximum Temperature 104°F
 - 3) Relative Humidity Not controlled

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 General

Pressure vessels described in this specification section and as shown on drawings listed in Attachment D shall be completely shop-manufactured. Each item shall be designed, fabricated, inspected, tested and certified in accordance both with ASME Section VIII, Division 1 and this specification section. Code stamping requirements shall be in accordance with drawings listed in Attachment D.

2.1.2 Materials

- A. All materials shall be of the material specification, grade and condition in accordance with the Contract Drawings listed in Attachment D. All pressure-retaining materials shall be in accordance with ASME Section II unless specified otherwise.
- B. All stainless steel materials shall be fully annealed in accordance with ASME Section II, Part A, Material Specification.

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- C. Stainless steel plate material shall be Number 1 finish with a hot-rolled, annealed, pickled and surface-cleaned finish in accordance with ASTM A480/A480M. Other forms of material shall have similar form of finish.
- D. Material shall be ordered with all surfaces in the iron-free condition. This condition shall be maintained throughout all phases of fabrication. The recommendation of ASTM A380, Section 8, shall be followed for the prevention of contamination.
- E. No substitution of materials shall be permitted.
- F. No welding repair of material defects shall be made without Buyer approval in each specific case.
- G. Nozzle necks that are fabricated from plate shall be the same material specification and grade as the vessel shell or head to which they are attached.
- H. Materials for external supports and clips welded directly to shell or head shall be the same type as specified for the vessel part to which they are attached.
- I. CMTRs shall be provided for all plate, sheet, piping, tubing, flanges and fittings that come into contact with the process liquid.
- J. If fabrication requires that the original identification markings be removed or if the material is divided into two or more parts, one of the following identification procedures shall be effected. This is to assure identification of all materials both during fabrication and on the as-built drawings.
- 1) One set of markings shall be accurately transferred to another location on the material.
 - 2) A coded marking shall be placed on the material.

2.1.3 Design

2.1.3.1 General

- A. Coincident design pressure and temperature shall be in accordance with the Contract Drawings. This will be the design pressure and temperature stamped on the vessel nameplate. Maximum Allowable Working Pressure (MAWP) shall be equal to Design Pressure (DP).
- B. Shop hydrostatic test pressure shall be 1.5 times MAWP.

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- C. The material thicknesses specified on the Contract Drawings for the equipment item number are minimum nominal dimensions including corrosion allowance. These are based on design analysis. The analysis considers all loadings to which the pressure vessel is expected to be subjected. Under no circumstances shall any specified material thickness be reduced. Additional material shall be added to the specified thickness of any component subject to thinning due to forming.
 - D. Corrosion allowance for vessel shell, heads and nozzle necks shall be in accordance with the Contract Drawings. Corrosion allowance for nonremovable internal parts shall be the same as the vessel applied to all exposed surfaces. The minimum corroded thickness shall be no less than 1/8 inch.
 - E. All internal and external attachments shall either be full-penetration welded or completely seal-welded. All details shall allow for complete drainage without pockets. Reinforcing pads shall have tapped holes plugged and seal-welded prior to shipment after all required testing has been completed.
 - F. The vessel lifting lugs shall be designed for a load that is 150 percent of the dry weight of the total assembled unit. Calculations shall be submitted for Buyer approval prior to lifting lug fabrication.

2.1.3.2 Connections

- A. The number, sizes, location and material shall be in accordance with the Contract Drawings.
- B. Nozzle flanges shall be in accordance with ANSI B16.5. Nozzle mark item number as shown on the Contract Drawings shall be stenciled at the side of all the flanges.
- C. The bore of nozzle necks, attachment pipe and flanges shall match or be tapered to match in accordance with ASME Section VIII, Division 1. The minimum thickness after tapering shall be not less than that required by ASME Section VIII, Division 1.
- D. Nozzle attachment welds made in accordance with ASME Section VIII, Division 1, Paragraph UW-3, Categories "B" and "D" shall be full-penetration welds through the thickness.
- E. The finish of the gasket contact surface of flange facings shall be in accordance with ANSI B16.5 unless otherwise shown on Contract Drawings.

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- F. The minimum neck thickness for manholes and inspection openings shall be in accordance with ASME Section VIII, Division 1 requirements for nozzles.
- G. Flange bolt hole orientation shall be in accordance with Attachment B of this specification section.

2.1.3.3 Seismic Design

Seismic design shall be in accordance with the provision of the Uniform Building Code (UBC) for nonstructural components supported by structures (Section 2312g) for UBC Zone 2b. The static horizontal seismic force (F_p) applied at the center of gravity in the direction under consideration shall be determined from the following equation:

$$F_p = ZIC_pW_p$$

where: $I = 1.25$
 $C_p = .75$ for vessels (including contents)
 ("T" less than 0.06 sec)
 $C_p = 1.5$ ("T" greater than 0.06 sec)
 W_p = weight of item being considered
 $Z = 0.20$

Consideration shall be made for the effects of vessel content sloshing during a seismic event.

2.2 FABRICATION AND MANUFACTURE

2.2.1 General

- A. Cleaning of stainless steel and its handling during fabrication shall be in accordance with Specification Section 13252.
- B. Longitudinal welded joints shall not be located behind any plate or obstruction which prevents inspection of the weld. Circumferential welded joints shall clear internal support rings or other attachment welds by not less than 1 inch.
- C. The vessel nameplate shall be austenitic stainless steel. It shall be not less than 1/8 inch thick. The background shall be etched 0.01 inch. The nameplate shall be welded to a bracket which in turn is welded to the vessel. The bracket shall extend 2 inches beyond the outside of the vessel or insulation. The nameplate shall include the following information:

- 1) Manufacturer's name and location (city and state)

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- 2) Manufacturer's serial number _____
- 3) Date built (month and year) _____
- 4) Maximum allowable working pressure _____ psig _____ °F
(coincident pressures and temperatures)
- 5) Minimum design metal temperature _____
- 6) Vessel equipment number _____
- 7) Vessel name _____
- 8) Vessel fabricated weight _____ pounds (round up to 3
significant digits or to hundreds)
- 9) Project control number _____

D. Each vessel shall be provided with two lifting lugs.

2.2.2 Welding

- A. Shell and head joints shall be full-penetration, double butt-welded joints.
- B. Nozzles shall be welded to the shell and heads with full-penetration groove welds unless specified otherwise on the Contract Drawings.
- C. Welding shall be in accordance with Specification Section 05063.

2.2.3 Heat Treatment

- A. When Seller elects to perform heat treatment or heat the material for forming above lower transformation temperature, the following procedures and records shall be submitted for approval.
- 1) Heating temperature/time.
 - 2) Holding temperature/time.
 - 3) Cooling rate and temperature.
- B. Additional welding on vessels which have been postweld heat treated shall not be permitted.
- C. Heating in the range of 800°F to 1600°F shall be avoided.

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2.2.4 Tolerances

Manufacturing tolerances shall be as shown in Attachment C of this specification section and in accordance with ASME Section VIII, Division 1 unless specified otherwise on the Contract Drawings.

2.2.5 Inspection and Tests

2.2.5.1 Nondestructive Examination (NDE)

- A. NDE methods and acceptance shall be in accordance with Specification Section 05063.
- B. The specific requirements for nondestructive examination shall be as shown by NDE symbols on Seller's drawings.
- C. When liquid penetrant inspection is specified, machining or grinding of the surface will not be allowed other than to remove excessive irregularities which would interfere with proper interpretation of results.

2.2.5.2 Pressure Tests

- A. All vessels shall be hydrostatically tested at the hydrotest pressure specified on the Contract Drawings. The hydrotest procedure shall be in accordance with ASME Section VIII, Division 1, Paragraph UG-99(b). Test pressure shall be held for not less than one hour.
- B. Seller shall submit detailed pressure testing procedures for each vessel. These shall include the fluid to be used and method of determining its temperature and test pressure. No vessel shall be closed for pressure testing without Buyer approval.
- C. Additional welding on the vessel shall not be permitted after hydrostatic tests have been completed.

2.2.5.3 Shop Inspection

- A. Shop inspections of each pressure vessel not code stamped shall be made by Seller. Seller inspection personnel shall be qualified in accordance with ASME Section VIII, Paragraph UG-91(a). The references to the inspector in ASME Section VIII, Paragraph UG-90 shall also apply to Seller.
- B. The alternative inspections in accordance with ASME Section VIII, Paragraph UG-90(c-2) shall not be permitted.

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2.2.5.4 Labeling

- A. Electro-etching or vegetable dyes shall be used to provide identification marking of materials and parts in accordance both with ASME Section VIII, Division 1 and ASME Section II, Part A. Do not use marking inks or crayons that contain more than 35 ppm of halogens or more than 5 ppm of harmful metal or salts such as zinc, lead, molybdenum or vanadium oxides. These may cause corrosive attack when the vessel part is heated. A certified statement from the marking ink manufacturer that these chemical content limits have been met will be considered acceptable.
- B. Vessels shall be clearly identified by dye stenciling the equipment name and equipment number in accordance with the Contract Drawings.
- C. The center of gravity shall be marked on all vertical vessels. The letters "C.G." and shipping weights in tons (or tenths of tons, e.g., 1.8 tons) shall be painted at two locations diametrically opposite and adjacent to the "C.G." markings.
- D. The dye stencil marking and lettering shall be white.

PART 3 EXECUTION

(Not Used)

END OF SECTION

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ATTACHMENT A
PRESSURE VESSEL MATERIAL RECORD

P.O. NUMBER _____
EQUIPMENT NUMBER _____

1.0 PRESSURE VESSEL SKETCH (PROVIDE ATTACHMENT)

2.0 PRIMARY MATERIAL RECORD

The following components shall be tabulated below:

- (a) PRESSURE COMPONENTS: Shell courses, conical reducing sections, heads, rolled plate nozzle necks, nozzle reinforcing pads.
- (b) NONPRESSURE COMPONENTS: All items which are required to be the same material specification as shell courses and heads.

ITEM	DESCRIPTION	MATERIAL	MANUFACTURER	HEAT NO.	SLAB NO.

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P.O. NUMBER _____
EQUIPMENT NUMBER _____

3.0 MATERIAL TEST REPORTS

Provide a reproducible copy of Certified Material Test Report for only those components tabulated in the primary material record.

4.0 MISCELLANEOUS MATERIALS

Flanges:

Structural Shapes:

Blind Flanges:

Other:

Nozzle Pipe Necks:

Internal Piping:

Support Skirt/Saddle:

Wear Plate:

Welded Internal Supports:

Welded External Attachments:

Bolting (Internal):

Bolting (External):

We certify that the materials as listed in this document were used in the construction of the subject pressure vessel.

SIGNED _____

DATE _____

TITLE _____

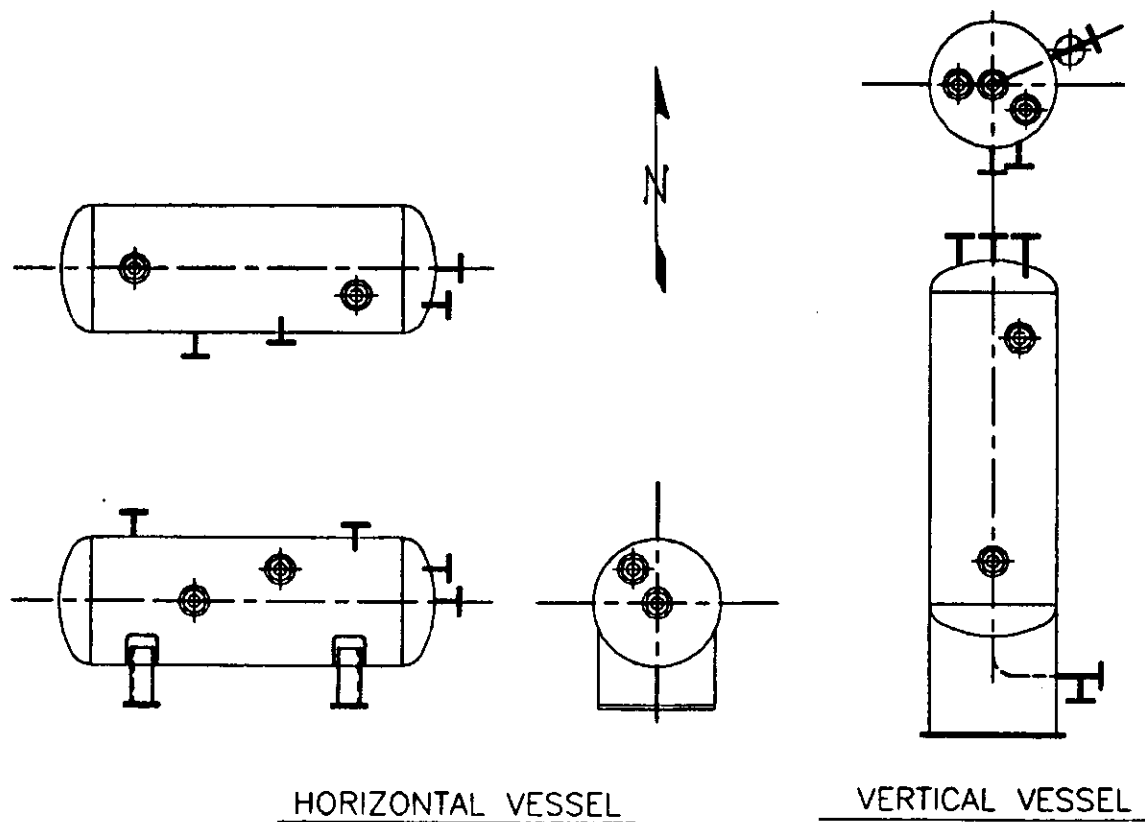
SELLER _____

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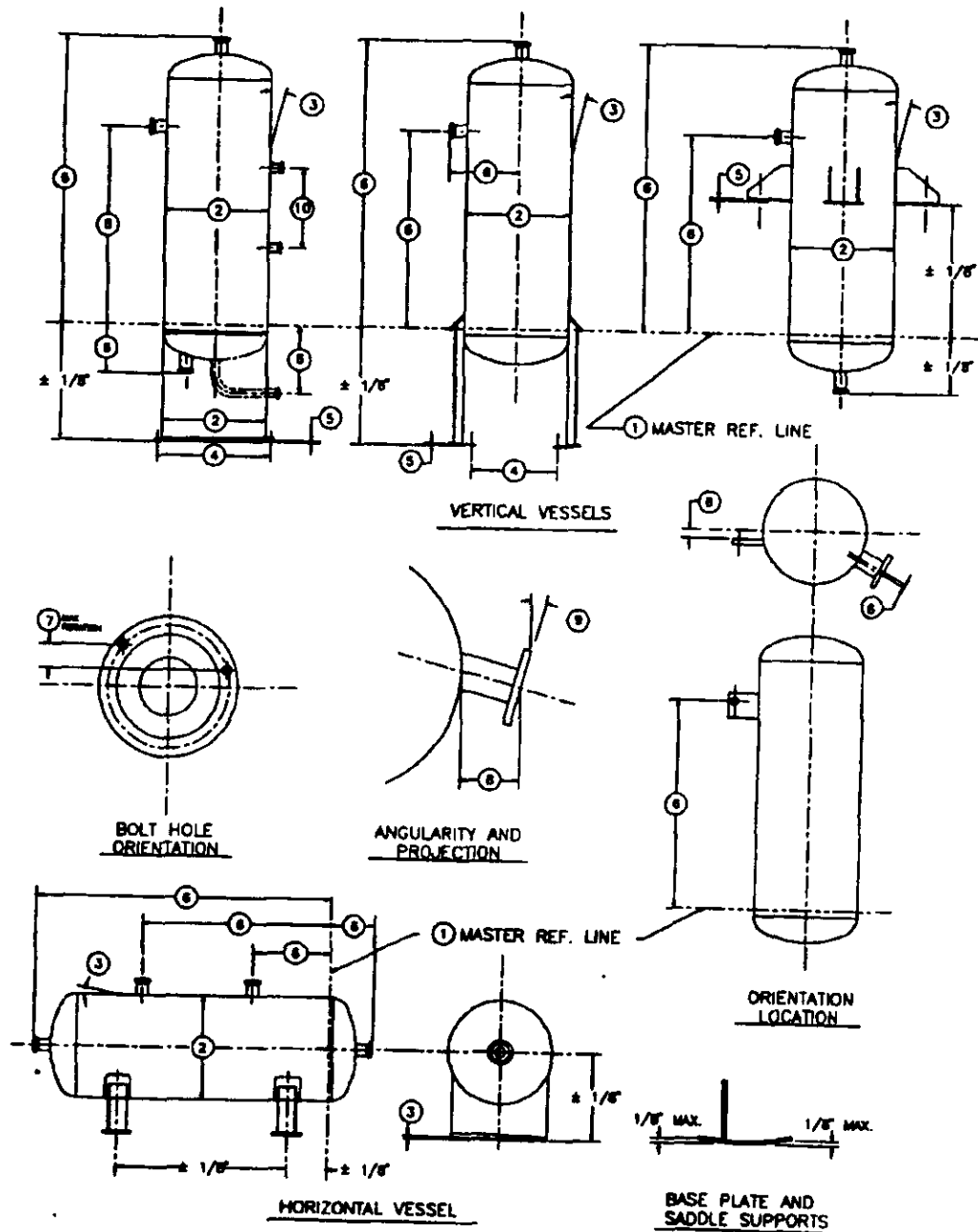
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ATTACHMENT B
FLANGE BOLT HOLE ORIENTATION



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ATTACHMENT C
VESSEL TOLERANCES



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The following notes are referenced to the numbered circles of Attachment C:

- ① The master reference line shall be established by the vessel manufacturer and clearly marked inside and outside of the shell prior to attaching the adjacent head. It shall be parallel to the root land of the shell course and perpendicular to the longitudinal axis of the vessel.

- ② Shell and Skirt Outside Circumference Tolerance:

OUTSIDE DIAMETER	SHELL OR SKIRT THICKNESS		
	UP TO 2-1/2"	2-1/2" TO 4"	OVER 4"
LESS THAN 4'-0"	± 3/8"	± 1/2"	
OVER 4'-0" TO 8'-0"	± 1/2"	± 3/4"	± 1"
OVER 8'-0" TO 15'-0"	± 3/4"	± 1"	± 1-1/2"
OVER 15'-0"	± 1"	± 1-1/2"	

NOTE:

MATCHING SHELL
AND HEAD SHALL BE
SUBJECT TO CODE
OFFSET TOLERANCE

- ③ Shell and Skirt Tolerance: Max. slope from straight line is 1/8" in 10'-0" with total max. deviations as follows:

TAN. TO TAN. LENGTH	TOTAL MAX. DEVIATION
UP TO 50' TO 100'-0"	1/2"
50'-0" TO 100'-0"	3/4"
100'-0" AND OVER	1"

- ④ The center of anchor bolt hole or pipe guide shall not deviate from the specified location on the bolt circle by more than the following:

VESSEL I.D.	MAX. DEVIATION
4'-0 AND LESS	1/8"
OVER 4'-0" TO 8'-0"	3/16"
OVER 8'-0"	1/4"

- ⑤ Out of level slopes = 1/32" per foot with 1/4" max.

	⑥	⑦	⑧	⑨
NOZZLES	± 1/4"	± 1/16"	± 3/16"	1/2°
COUPLINGS	± 1/4"	----	----	----
MANHOLE HANDHOLES	± 1/2"	± 1/2"	± 1/2"	1°
CLIPS	± 1/4"	----	----	----

- ⑩ Max. deviation between any (2) coupled instrument connections = 1/16"

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ATTACHMENT D
CONTRACT DRAWINGS

DRAWING NUMBER	TITLE
Drawing H-2-120151	TK-540-014 Nitric Acid Decon Make-up Tank
Drawing H-2-120152	TK-540-017 Oxalic Acid Decon Feed Tank
Drawing H-2-120156	TK-210-001 Crane Decon Feed Tank (acid)
Drawing H-2-120157	TK-210-002 Crane Decon Feed Tank (caustic)
Drawing H-2-120161	TK-450-001 Process Cooling Expansion Tank
Drawing H-2-120162	TK-460-001 Melter Cooling Water Expansion Tank
Drawing H-2-120163	TK-480-001 Process Water Tank
Drawing H-2-120164	TK-520-001 Floor Drain Catch Tank
Drawing H-2-120165	TK-520-002 Regulated Drain Catch Tank
Drawing H-2-120166	TK-520-003 Acid Drain Catch Tank
Drawing H-2-120167	TK-520-004 Organic Acid Drain Catch Tank
Drawing H-2-120168	TK-520-005 Floor Drain Sampling Tank
Drawing H-2-120169	TK-540-002 Sugar Solution Feed Tank
Drawing H-2-120170	TK-540-004 Offgas Treatment Chemical Feed Tank
Drawing H-2-120171	TK-540-006 KOH/Frit Modifier Feed Tank
Drawing H-2-120172	TK-540-008 Formic Acid Feed Tank
Drawing H-2-120173	TK-540-012 50% Nitric Acid Feed Tank
Drawing H-2-120174	TK-540-019 Potassium Permanganate Feed Tank
Drawing H-2-120175	TK-540-021 Sodium Nitrite Feed Tank
Drawing H-2-120176	TK-540-023 50% Caustic Feed Tank
Drawing H-2-120177	TK-540-024 Flush Water Feed Tank
Drawing H-2-120178	TK-540-027 Diatomaceous Earth Slurry Feed Tank
Drawing H-2-120179	TK-540-029 Zeolite Slurry Feed Tank
Drawing H-2-120180	TK-540-031 Dilute Sodium Hydroxide Feed Tank
Drawing H-2-120181	TK-580-002 Process Frit Slurry Feed Tank
Drawing H-2-120182	TK-580-003 Decon Frit Slurry Feed Tank
Drawing H-2-120442	TK-540-034 Antifoam Feed Tank

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Advanced Technology Division
Fluor Contract 8457

SECTION 14583
COLD FEED AGITATORS
B-595-P-P33B-14583

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA YES NO X
QUALITY LEVEL I II X
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

CHECKER:

F. Bizjak
F. Bizjak, Mechanical Engineer 1-26-93 Date

D. A. Buzzelli
D. A. Buzzelli, Lead Disc. Checker 1-26-93 Date

APPROVED BY:

R. B. Erickson
C. J. Divona Lead Discipline Engineer

1-26-93
Date

SECTION 14583
COLD FEED AGITATORS
B-595-P-P33B-14583

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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>
A	AGITATOR DATA SHEETS
B	EQUIPMENT MAXIMUM ENVELOPE AND MODEL NUMBER OR EQUAL

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SECTION 14583
COLD FEED AGITATORS

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the design, materials, fabrication, quality, inspection, testing and delivery requirements of agitators for use in non-radioactive slurries and chemicals. The requirements outlined herein supplement the agitator data sheets (Attachment A).

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
and/or
AMERICAN GEAR MANUFACTURERS INSTITUTE (AGMA)

ANSI/AGMA 6000 1988 (Rev. A) Specification for
Measurement of Linear Vibration on Gear
Units

ANSI/AGMA 6010 1988 Standard for Spur, Helical,
Herringbone and Bevel Enclosed Drives

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
and/or
AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ANSI/ASME B16.5 1988 Pipe Flanges and Flanged Fittings

ANSI/ASME B46.1 1985 Surface Texture (Surface Roughness,
Waviness, and Lay)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A182/A182M 1991 Standard Specification for Forged or
Rolled Alloy-Steel Pipe Flanges, Forged
Fittings, and Valves and Parts for High-
Temperature Service

ASTM A240 1991 (Rev. A) Standard Specification for
Heat-Resisting Chromium and Chromium-
Nickel Stainless Steel Plate, Sheet, and
Strip for Pressure Vessels

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ASTM A312/A312M	1991 (Rev. B) Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipe
ASTM A479/A479M	1991 (Rev. A) Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels
ASTM A744/A744M	1991 Standard Specification for Castings, Iron-Chromium Nickel, Corrosion Resistant, for Severe Service
ANTI-FRICTION BEARING MANUFACTURERS ASSOCIATION (AFBMA)	
AFBMA 9	1990 Load Ratings and Fatigue Life for Ball Bearings
AFBMA 11	1990 Load Ratings and Fatigue Life for Roller Bearings
OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)	
OSHA Standard Instruction 1-12.14	1978 Guards for Rotating Equipment
STEEL STRUCTURES PAINTING COUNCIL (SSPC)	
SSPC SP-6	1989 Surface Preparation Specification No. 6, Commercial Blast Cleaning
SSPC SP-10	1989 Surface Preparation Specification No. 10, Near-White Blast Cleaning

1.3 RELATED REQUIREMENTS

Specification Section 01730	Operation and Maintenance Data
Specification Section 05066	Welding Specialty Equipment
Specification Section 13252	Precaution for the Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys
Specification Section 15196	Identification and Tagging Methods for Mechanical Equipment
Specification Section 16150	Motors - Induction for General Service

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1.4 DEFINITIONS

CMTR - Certified Material Test Report
FAT - Factory Acceptance Test
NDE - Nondestructive Examination
PT - Liquid Penetrant Examination
RPM - Revolutions per Minute
TEFC - Totally Enclosed Fan Cooled

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

- 1.6.1 Assembly and outline drawings of the equipment shall be submitted for Buyer approval. The following information shall be included on or submitted with the drawings:
- A. Two views of the agitator assembly (plan and elevation).
 - B. Cross section of drive assembly. Cross section shall show shaft diameter and bearing spans.
 - C. Mechanical seal or stuffing box assembly.
 - D. Complete specification, designation and Certified Material Test Reports (CMTRs) of all materials.
 - E. Weight of agitator assembly. This shall include the driver, mounting plate and lifting assembly weights. All loads (torque, bending moments) imposed on the vessel nozzle shall be shown. Weights of separate removable parts shall be shown if agitators cannot be removed as a complete assembly. Weights of agitator assembly components (electric motor, reduction gear box and agitator shaft and impeller) shall be shown on the drawings.
 - F. Dimensions. These shall include height, width, maintenance space required, service connection locations, mounting details, mounting flange details, lifting assemblies and other pertinent dimensions with reference to the datum plane (bottom of mounting plate).
 - G. Buyer purchase order and item numbers.
 - H. Bill of materials.

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1.6.2 Instructions for operation, maintenance and storage shall be submitted for Buyer review. These instructions shall incorporate theory of operation, operational adjustments, troubleshooting, instructions for assembly and disassembly and complete parts list with part numbers. Site storage instructions shall include requirements for handling, short-term and long-term storage. Data shall be submitted in accordance with Specification Section 01730. Complete installation manuals shall also be submitted.

1.6.3 A list of recommended spare parts for one (1) year's routine operation shall be supplied. The spare parts list shall include sufficient data to permit procurement of standard parts from the original manufacturer or any sub-supplier. Seller shall provide a sectional view of the identified parts.

1.6.4 Completed agitator data sheets (Attachment A). Electric motor data sheets (Attachment A) of Specification Section 16150 shall be completed and submitted.

1.6.5 Design Calculations

An engineering design analysis shall be provided. The analysis shall contain supporting calculations used to establish horsepower requirements, shaft sizes, bearing loads, nozzle loads, operational characteristics and technical descriptions. Calculations shall be complete and in sufficient detail to permit second party review. Seller shall establish and guarantee the forces and moments on the agitator nozzle. Lifting eye calculations shall be included.

1.6.6 Certified Factory Acceptance Test (FAT) procedures, inspection and quality assurance control plan in accordance with Paragraph 2.5.

1.6.7 Certified performance FAT results prior to shipment in accordance with Paragraph 2.5.

1.6.8 Lubrication requirements in accordance with Paragraph 2.2.4.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

A. Site Elevation 714 feet above sea level

B. Barometric Pressure 14.3 psia

C. Outside Design Temperature

1) Maximum Design Temperature 110°F

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2) Minimum Design Temperature -20°F

3) Wet Bulb Design Temperature 68°F

1.8.2 Operating Environment

- A. Normal Temperature 60°F to 104°F
- B. Maximum Temperature 104°F
- C. Relative Humidity Not Controlled

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Materials

2.1.1.1 All pipe, fittings, plate, bar, castings and forgings shall be in accordance with ASTM A182/A182M, ASTM A240, ASTM A312/A312M, ASTM A479/A479M and ASTM A744/A744M as applicable. Wet-end components and those components likely to be exposed to vapors of chemicals being handled shall be stainless steel. These include impeller, shaft, outboard bearing, shaft seal housing and mounting flange facing. Type of stainless steel to be used for wetted parts shall be in accordance with agitator data sheets (Attachment A).

- A. Seller may utilize standard materials of construction on internal gear reducer, motor, bearing and coupling components. Exterior surfaces of the above components may also be Seller's standard materials of construction.
- B. All other components shall be Seller's standard materials of construction.

2.1.1.2 Design envelopes and model numbers for each agitator are referenced in Attachment B.

2.2 FABRICATION AND MANUFACTURE

2.2.1 General Requirements

2.2.1.1 Agitators shall provide mixing of components shown on the agitator data sheets (Attachment A) with respect to class and degree of agitation.

2.2.1.2 The equipment shall be designed for mounting on the type of vessel as stated on the agitator data sheets (Attachment A).

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- 2.2.1.3 The equipment shall have a design life of not less than 20 years at the specified conditions. This requirement excludes expendable items such as impellers, bearings, seals and gaskets.
- 2.2.1.4 The agitators will be used for chemical agitation in a nuclear waste processing facility. They shall not, however, be exposed to radiation.
- 2.2.1.5 The agitator shall be Seller's standard low-risk design, modified as required to be in accordance with this specification section.
- 2.2.1.6 The equipment shall be of proven design with a minimum of two years of successful operation in equal or more severe design and operating conditions as outlined in the agitator specification section.
- 2.2.1.7 Seller shall follow the requirements of Specification Section 13252 both prior to and after welding to minimize contamination of stainless steel.
- 2.2.2 Technical Requirements
- 2.2.2.1 Bearings shall be of the sealed anti-friction type. They shall be in accordance either with AFBMA 9 or AFBMA 11. Bearing L-10 life shall be not less than 40,000 hours. Agitators in frit slurry service shall be designed for start-up torques at least double the expected running torque and bearing L-10 life of 100,000 hours. Bearings shall be fitted with zerk fittings and purge parts.
- 2.2.2.2 Agitators shall be single speed, top entering and flange mounted on closed tanks. Agitators shall be provided with single mechanical seals or stuffing boxes as required on agitator data sheets (Attachment A). Direction of agitator shaft rotation shall be clockwise looking downward.
- 2.2.2.3 A service factor of not less than 1.5 shall be used in accordance with ANSI/AGMA 6010, Appendix A, Table A-3, unless otherwise specified on the agitator data sheets (Attachment A). A "Uniform" load classification shall be used. All gear drives shall be either helical or herringbone type in accordance with ANSI/AGMA 6010. AGMA gear quality class shall be 10 or better. Mechanical rating shall be not less than 1.5 times the nameplate motor horsepower. Thermal horsepower shall be not less than the nameplate motor horsepower. The mixer blade tip speed for agitators in frit slurry service shall be limited to 800 ft/min.
- 2.2.2.4 Shafts shall be sized to withstand forces resulting from starting at maximum tank level and operating in an empty tank. Impeller thrust in the fluid shall be downward and shaft thrust shall be upward in all cases where the impeller is designed to provide axial thrust. Bottom steady bearings shall not be provided. The

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agitator shaft may be hollow. The shaft's calculated maximum combined shear stress shall be less than 20% of the construction material's tensile yield strength. Mixer shafts shall be straight to within 0.003 in./foot.

- 2.2.2.5 The first critical speed shall be not less than 135 percent of the maximum operating speed.
- 2.2.2.6 All assembly joints shall include alignment or centering fits as required to ensure accurate reassembly of all parts. Shaft and impeller assembly may either be bolted or welded construction. Bolted assemblies shall be secured to prevent impeller blade unbolting. The impeller shaft assembly shall be statically balanced as follows:
- A. Impeller shaft speed up to 125 rpm inclusive to 0.5 ounce-inch per pound of rotating weight.
 - B. Impeller shaft speed from 125-350 rpm to 0.25 ounce-inch per pound of rotating weight.
- 2.2.2.7 The vibration limits shall be in accordance with ANSI/AGMA 6000.
- 2.2.2.8 Pressure-containing components shall be suitable for the design pressure and temperature of the mixing vessel. This requirement includes mounting flanges. Flanges shall be in accordance with ANSI/ASME B16.5. Flange size and rating shall be as specified on the agitator data sheets (Attachment A). Mounting flanges facing shall have a surface finish of 125 RMS in accordance with ANSI/ASME B46.1.
- 2.2.2.9 Seller shall provide a flexible, forged steel coupling between the power drive and the agitator gear drive. Motor to reducer input coupling shall have a service factor of not less than 2.0 based on motor capacity. Inside tank coupling is required when specified on the agitator data sheets (Attachment A). Coupling materials shall be compatible with shaft materials.
- 2.2.2.10 Couplings shall be keyed in both shafts. The coupling design shall allow removal of the hub without the need for heating. All exposed rotating parts shall be provided with heavy-duty guards in accordance with OSHA Standard Instruction 1-12.14. Guards shall be removable.
- 2.2.2.11 The agitator design shall include provisions for ensuring that drive and agitator components are aligned during assembly.

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- 2.2.2.12 The design shall be such that bearings, seals, driver and gear units may be replaced without dismantling other major parts. It shall also be possible to replace these parts without emptying or depressuring the vessel.

2.2.3 Shaft Seal

The shaft seal type shall be as specified on the agitator data sheets (Attachment A). Seal parts shall be inert both to the fluids being mixed and to any lubricant used. Nonmetallic components are included in this requirement. The use of any pressurized external lubrication system shall not be acceptable.

- 2.2.3.1 Stuffing boxes shall include the following minimum design characteristics:

- A. They shall be an integral part of the cover.
- B. Seal cage design shall allow easy removal.
- C. They shall have not less than 3 rings of packing plus the seal cage.
- D. The design shall allow space to permit packing replacement without removing or dismantling any part other than the gland and seal cage.

2.2.4 Lubrication Requirements

Seller shall submit the lubrication requirements for the agitator on Seller's lubrication data sheet. Lubricants shall be recommended by Seller. Lubricants shall be able to be drained and replenished. A synthetic gear lubricant is preferred.

2.2.5 Electric Motors

- 2.2.5.1 Seller shall provide each agitator with a totally-enclosed fan-cooled (TEFC), chemical-type motor in accordance with Specification Section 16150. Seller shall complete electric motor data sheets from Specification Section 16150 (Attachment A) for each agitator. Drive motors shall be vertical.

- 2.2.5.2 The motor thrust bearing shall have a minimum rating of 120 percent of the maximum axial thrust load that can be transmitted to the bearing.

- 2.2.5.3 Motors shall be single-speed. It is intended that the motor be the weakest link in a high-torque event and that the shaft, impeller blades, etc. do not fail in any such event.

- 2.2.5.4 Motors shall be suitable for continuous duty.

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2.2.6 Welding

Welding shall be in accordance with Specification Section 05066.

2.2.7 Painting

2.2.7.1 Stainless steel and nickel-based alloy construction materials shall not be painted. All carbon steel exposed surfaces shall be shop-primed and finish-painted in accordance with Seller's standards.

2.2.7.2 All machinery and equipment shall have a clean and finished appearance when delivered to Buyer. Prior to painting all surfaces shall be free of dirt, rust, grease, weld spatter, loose mill scale or other deleterious substances. Surfaces to be painted shall be cleaned in accordance either with SSPC SP-6 or SSPC SP-10 in accordance with Seller's surface preparation procedure. The paint type and quality shall be Seller's standard. It shall be applied in accordance with the paint manufacturer's recommended procedures. Colors will be advised by Buyer.

2.2.8 Noise

The noise level shall not exceed 85 dBA at 3 feet periphery around the agitator mounting flange.

2.2.9 Performance

Seller shall guarantee that the agitator is in accordance with all specified operating conditions and satisfactory application in all respects to the conditions described both in this specification section and the agitator data sheets (Attachment A).

2.2.10 Lifting Eyes

2.2.10.1 Lifting eyes shall be furnished for crane handling. These shall be positioned to give maximum balance with an even weight distribution to minimize handling hazards. Each lifting eye shall be designed to carry twice the lifting load. Agitator lifting assemblies shall be designed and fabricated with two lifting eyes.

2.3 OPERATING AND DESIGN CONDITIONS

2.3.1 Operating Conditions

2.3.1.1 Agitators will operate in various applications. These include blending of clear liquids to full solids suspension of thick slurries. Refer to the agitator data sheets (Attachment A) for each application.

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2.3.2 Design Conditions

Agitators shall be designed to operate in process tanks under design conditions stated in the agitator data sheets (Attachment A).

2.4 LABELING

Labeling shall be in accordance with Specification Section 15196. This shall be in addition to the manufacturer's identification plate. The nameplates shall be stamped or embossed with not less than the following information:

Purchase order number
Equipment number
Manufacturer's model number
Rated horsepower
Impeller diameter
Impeller RPM
Materials of construction of wetted parts

The nameplate shall be completely visible after assembly of the equipment.

2.5 TESTING AND INSPECTION

2.5.1 General

2.5.1.1 Seller shall supply Buyer with all certified test data whether witnessed or not. Agitators shall not be shipped until Buyer has reviewed test data. All equipment shall be completely shop-assembled. Locating dimensions of mounting bolt holes shall be verified.

- A. Agitators shall be no-load tested for 15 minutes or until oil temperatures have stabilized. Agitators shall then be tested complete with agitator shafts in accordance with test procedure to be submitted for Buyer approval. The test medium shall be water.
- B. Seller shall provide test procedures that demonstrate the performance characteristics of the agitator (i.e., efficiency, mixing characteristics, horsepower needed, maximum volume capability for mixing designated liquid or slurry as specified in data sheets (Attachment A). Test procedures shall be approved by Buyer before use.
- C. Seller shall provide certified results and reports for all FATs performed.

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D. Vibration tests of complete assembly shall be performed in accordance with ANSI/AGMA 6000.

2.5.1.2 Seller shall furnish copies of their inspection and quality control plan to Buyer.

2.5.1.3 Materials and workmanship shall be subject to inspection by Buyer. Inspection shall take place in Seller's shop.

2.5.1.4 At minimum the Buyer's inspector shall check equipment components, tagging, critical installation dimensions, connection sizes, connection locations and quality of workmanship against certified drawings, data and purchase order documents.

2.5.1.5 Preparation for shipment shall be subject to inspection.

2.5.2 Nondestructive Examination - General

2.5.2.1 Nondestructive examination (NDE) acceptance criteria of welds shall be in accordance both with Specification Section 05066 and this specification section.

2.5.2.2 All welds shall be 100% radiographically examined. Where it is not physically possible to perform radiographic examination welds shall be examined by liquid penetrant examination (PT). Where it is not physically possible to radiograph lifting eye welds, 100% of the root and final weld passes shall be PT examined.

2.5.3 Final Dimensional Checks

After fabrication and testing Seller shall verify measurements by means of as-built dimension drawings. The procedure selected for final dimensional check shall be submitted for Buyer review. Buyer may witness Seller's dimensional verification measurements at Buyer's option. Seller shall provide proof that the agitators and agitator appurtenances are dimensionally correct within the specified tolerances in accordance with this specification section.

2.6 PACKAGING

Preparation for shipment and packing may conform to the Seller's standards. At minimum, the packaging shall provide protection against corrosion and damage from normal handling and storage. Minimum preparation shall include the requirements listed below.

A. Machined surfaces, threads, bearings and bearing housings shall be protected during shipment by application of grease or other suitable rust-inhibiting compound.

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- B. Threaded connections and tapped holes shall be capped or plugged. Compatible materials shall be used to prevent thread damage.
- C. The agitator motor shall be fully protected against moisture penetration to the electrical compartments and winding.
- D. Mechanical seals and other sealing devices shall be installed for shipment.
- E. Bracing, supports and rigging connections shall be provided to prevent damage during shipment, lifting and unloading. Lifting points shall be clearly marked.
- F. Separate or loose parts shall be completely boxed and attached to the main item to be shipped as a unit. All shipping boxes shall be identified by the Seller's order number, equipment number and equipment description.

PART 3 EXECUTION

(Not Used)

END OF SECTION

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ATTACHMENT A



FLUOR DANIEL

DATA SHEET

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

AGITATOR

NO. △ △ △ △ △ △	BY DATE	REVISION	SHEET NO. P33B-DS-1	REV. 0
			DATE 03-20-90	CONTRACT 845734
			TAG NO. AG-520-001	
			SPECIFICATION SECT NO. 14583	
			ORIG BY HBJO	CHK'D SSL
			APPR'D	

SERVICE FLOOR DRAIN CATCH TANK AGITATOR (TK-520-001)
NO. UNITS 1 TYPE: PORTABLE SIDE ENTERING TOP ENTERING ☒ BTM ENTERING

MATERIALS TO BE MIXED

BATCH ☒CONTINUOUS ☐

COMPONENT	QUANTITY - LBS	VISCOSITY - Cp	SP GRAVITY	°F	PSIG
CASE 1. WASTE WATER	20400	0.98	0.9980	77	-0.1
CASE 2. 50% wt SODIUM HYDROXIDE SOLUTION (ACCIDENT)	31000	85	1.52	77	-0.1
FINAL MIX (NOT APPLICABLE)					

CLASS OF AGITATION: BLEND ☒ DISSOLVE ☐ DISPENSE GAS ☐ SUSPEND SOLIDS ☐ HEAT EXCHANGE ☐ EMULSIFY ☐
OTHER HOMOGENIZE PRIOR TO SAMPLING FOAMING YES ☐ NO ☒
DEGREE OF AGITATION: MILD ☐ MEDIUM ☒ VIOLENT ☐
TOO MUCH AGITATION WILL RESULT IN SPLASHING
TOO LITTLE AGITATION WILL RESULT IN SETTLING OF PARTICULATES
IF BATCH, LARGEST OR LEVEL BATCH IS 2500 GALLONS SMALLEST 1250 GALLONS
MIXER SHALL BE DESIGNED TO 2500 GALLONS IN MINUTES

MIXER WILL ☒ WILL NOT ☐ BE OPERATED WHILE FILLING OR DRAWING OFF
VESSEL: OPEN TOP ☐ CLOSED TOP ☒ HORIZ ☐ VERTICAL ☒ API TANK ☐
SIZE: 7'-0" I.D. " X 8'-6" STRAIGHT SIDE OR LENGTH "
BOTTOM TYPE: FLAT ☐ FLANGED AND DISHED ☐ 2:1 SEMI-ELLIPTICAL ☒ CONE ☐
TOP TYPE: FLAT ☒ FLANGED AND DISHED ☐ 2:1 SEMI-ELLIPTICAL ☐
MIXER MOUNTING FLANGE: SIZE 14" RATING ANSI 150# RF
LOCATION AGITATOR MOUNTING FLANGE TOP
DESIGN PRESSURE 5-5 PSIG DESIGN TEMPERATURE 150 °F
BAFFLES: NO 4 WIDTH IN LENGTH IN VERTICAL ☒ HORIZONTAL ☐
MIXER: MOTOR DRIVE: AC ☒ DC ☐ EXP PROOF ☐ TEFC ☒ D.P. ☐
3 PHASE 60 CYCLE 480 VOLTS

SHAFT SEAL: MECHANICAL ☒ PACKING ☐ TYPE LUBRICATION
SIZE OPENING FOR IMPELLER INSTALLATION 14"
HEAD ROOM ABOVE VESSEL FOR INSTALLING MIXER
MATERIALS OF CONSTRUCTION WETTED PARTS 304L SS
MINIMUM AGMA SERVICE FACTOR FOR GEAR REDUCER MINIMUM BEARING LIFE (L-10)

DATA BY VENDOR

MIXER MODEL NO.
DRIVE: HORSEPOWER RPM MFG R
GEAR: RATIO AGMA RATING OUTPUT RPM MFG R
SHAFT COUPLING: DESCRIBE
MECHANICAL SEAL: DESCRIBE
STUFFING BOX: DESCRIBE
SHAFT: OD" LENGTH FROM MOUNTING FLANGE, INCHES
IMPELLER TYPE OD" NO. BLADES REMOVABLE FROM SHAFT YES ☐ NO ☐
ADDITIONAL DATA

REMARKS

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SAFETY CLASSIFICATION 3
IMPACT LEVEL

P33B-14583

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ATTACHMENT A



FLUOR DANIEL

DATA SHEET

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

AGITATOR

NO.	BY DATE	REVISION	SHEET NO. P33B-DS-2	REV. 0
△			DATE 03-20-90	CONTRACT 845734
△			TAG NO. AG-520-002	
△			SPECIFICATION SECT NO. 14583	
△			DRG BY HEJO	CHK'D SSL
△			APPR'D	

SERVICE ACID DRAIN CATCH TANK AGITATOR (TK-520-003)
NO. UNITS 1 TYPE: PORTABLE SIDE ENTERING TOP ENTERING X BTM ENTERING

MATERIALS TO BE MIXED

BATCH ☒CONTINUOUS ☐

COMPONENT	QUANTITY - LBS	VISCOSITY - Cp	SP GRAVITY	F	PSIG
CASE 1. TYPICALLY WASTE	3750	0.98	0.9980	70	-0.1
WATER (POSSIBLY ACIDIC)					
CASE 2. 50 wt% NITRIC ACID	4880	1.90	1.31	70	-0.1
FINAL MIX (NOT APPLICABLE)					

CLASS OF AGITATION: BLEND ☒ DISSOLVE ☐ DISPENSE GAS ☐ SUSPEND SOLIDS ☐ HEAT EXCHANGE ☐ EMULSIFY ☐
OTHER HOMOGENIZE PRIOR TO SAMPLING FOAMING YES ☐ NO ☒

DEGREE OF AGITATION: MILD ☐ MEDIUM ☒ VIOLENT ☐

TOO MUCH AGITATION WILL RESULT IN SPLASHING

TOO LITTLE AGITATION WILL CAUSE SETTLING OF SUSPENDED PARTICULATES

IF BATCH, LARGEST OR LEVEL BATCH IS 850 GALLONS SMALLEST 326 GALLONS
MIXER SHALL BE DESIGNED TO 850 GALLONS IN MINUTES

MIXER WILL ☒ WILL NOT ☐ BE OPERATED WHILE FILLING OR DRAWING OFF

VESSEL: OPEN TOP ☐ CLOSED TOP ☒ HORIZ ☐ VERTICAL ☒ API TANK ☐
SIZE: 5'-0" I.D. " X 6'-6" STRAIGHT SIDE OR LENGTH "

BOTTOM TYPE: FLAT ☐ FLANGED AND DISHED ☐ 2:1 SEMI-ELLIPTICAL ☒ CONE ☐

TOP TYPE: FLAT ☒ FLANGED AND DISHED ☐ 2:1 SEMI-ELLIPTICAL ☐

MIXER MOUNTING FLANGE: SIZE 12" RATING ANSI 150# RF

LOCATION AGITATOR MOUNTING FLANGE TOP

DESIGN PRESSURE 5/-5 PSIG DESIGN TEMPERATURE 150 °F

BAFFLES: NO 4 WIDTH IN LENGTH IN VERTICAL ☒ HORIZONTAL ☐

MIXER: MOTOR DRIVE: AC ☒ DC ☐ EXP PROOF ☐ TEFC ☒ D.P. ☐
3 PHASE 60 CYCLE 460 VOLTS

SHAFT SEAL: MECHANICAL ☒ PACKING ☐ TYPE LUBRICATION

SIZE OPENING FOR IMPELLER INSTALLATION 12"

HEAD ROOM ABOVE VESSEL FOR INSTALLING MIXER

MATERIALS OF CONSTRUCTION WETTED PARTS 304L SS

MINIMUM AGMA SERVICE FACTOR FOR GEAR REDUCER MINIMUM BEARING LIFE (L-10)

DATA BY VENDOR

MIXER MODEL NO.
DRIVE: HORSEPOWER RPM MFGR
GEAR: RATIO AGMA RATING OUTPUT RPM MFGR
SHAFT COUPLING: DESCRIBE
MECHANICAL SEAL: DESCRIBE
STUFFING BOX: DESCRIBE
SHAFT: OD" LENGTH FROM MOUNTING FLANGE, INCHES
IMPELLER TYPE OD" NO. BLADES REMOVABLE FROM SHAFT YES ☐ NO ☐
ADDITIONAL DATA

REMARKS

ATTACHMENT A

FLUOR DANIEL DATA SHEET U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 AGITATOR	NO.	BY DATE	REVISION	SHEET NO. P33B-DS-3	REV. 0
	▲			DATE 03-20-90	CONTRACT 845734
	▲			TAG NO. AG-520-003	
	▲			SPECIFICATION SECT NO. 14583	
	▲			ORIG BY HBJO	CHK'D SSL

SERVICE ORGANIC ACID DRAIN CATCH TANK AGITATOR (TK-520-004)					
NO. UNITS 1	TYPE: PORTABLE	SIDE ENTERING	TOP ENTERING X	BTM ENTERING	

MATERIALS TO BE MIXED					
COMPONENT	QUANTITY - LBS	VISCOSITY - Cp	SP GRAVITY	°F	PSIG
CASE 1. TYPICALLY WASTE WATER (POSSIBLY ACIDIC)	8550	0.98	0.9980	70	-0.1
CASE 2. 90 Wt% FORMIC ACID	10250	1.85	1.2	70	-0.1
FINAL MIX (NOT APPLICABLE)					

CLASS OF AGITATION: BLEND <input checked="" type="checkbox"/> DISSOLVE <input type="checkbox"/> DISPENSE GAS <input type="checkbox"/> SUSPEND SOLIDS <input type="checkbox"/> HEAT EXCHANGE <input type="checkbox"/> EMULSIFY <input type="checkbox"/> OTHER HOMOGENIZE PRIOR TO SAMPLING FOAMING YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>					
DEGREE OF AGITATION: MILD <input type="checkbox"/> MEDIUM <input checked="" type="checkbox"/> VIOLENT <input type="checkbox"/> TOO MUCH AGITATION WILL CAUSE EXCESSIVE SPLASHING TOO LITTLE AGITATION WILL CAUSE SETTLING OF SUSPENDED PARTICULATES					
IF BATCH, LARGEST OR LEVEL BATCH IS 1025 GALLONS SMALLEST 525 GALLONS MIXER SHALL BE DESIGNED TO 1025 GALLONS IN 10 MINUTES					
MIXER WILL <input checked="" type="checkbox"/> WILL NOT <input type="checkbox"/> BE OPERATED WHILE FILLING OR DRAWING OFF					
VESSEL: OPEN TOP <input type="checkbox"/> CLOSED TOP <input checked="" type="checkbox"/> HORIZ <input type="checkbox"/> VERTICAL <input checked="" type="checkbox"/> API TANK <input type="checkbox"/> SIZE: 5'-0" I.D. " X 6'-6" STRAIGHT SIDE OR _____ LENGTH "					
BOTTOM TYPE: FLAT <input type="checkbox"/> FLANGED AND DISHED <input type="checkbox"/> 2:1 SEMI-ELLIPTICAL <input checked="" type="checkbox"/> CONE <input type="checkbox"/> TOP TYPE: FLAT <input checked="" type="checkbox"/> FLANGED AND DISHED <input type="checkbox"/> 2:1 SEMI-ELLIPTICAL <input type="checkbox"/> MIXER MOUNTING FLANGE: SIZE 12" RATING ANSI 150# RF					
LOCATION AGITATOR MOUNTING FLANGE TOP DESIGN PRESSURE 5/-5 PSIG DESIGN TEMPERATURE 150 °F					
BAFFLES: NO 4 WIDTH _____ IN LENGTH _____ IN VERTICAL <input checked="" type="checkbox"/> HORIZONTAL <input type="checkbox"/>					
MIXER: MOTOR DRIVE: AC <input checked="" type="checkbox"/> DC <input type="checkbox"/> EXP PROOF <input type="checkbox"/> TEFC <input checked="" type="checkbox"/> D.P. <input type="checkbox"/> 3 PHASE 60 CYCLE 480 VOLTS					
SHAFT SEAL: MECHANICAL <input checked="" type="checkbox"/> PACKING <input type="checkbox"/> TYPE LUBRICATION _____					
SIZE OPENING FOR IMPELLER INSTALLATION 12"					
HEAD ROOM ABOVE VESSEL FOR INSTALLING MIXER _____					
MATERIALS OF CONSTRUCTION WETTED PARTS 304L SS					
MINIMUM AGMA SERVICE FACTOR FOR GEAR REDUCER _____ MINIMUM BEARING LIFE (L-10) _____					

DATA BY VENDOR			
MIXER MODEL NO. _____	DRIVE: _____ HORSEPOWER _____ RPM _____	MFGR _____	
GEAR: _____ RATIO _____	AGMA RATING _____	OUTPUT RPM _____	MFGR _____
SHAFT COUPLING: DESCRIBE _____			
MECHANICAL SEAL: DESCRIBE _____			
STUFFING BOX: DESCRIBE _____			
SHAFT: _____ OD" _____ LENGTH FROM MOUNTING FLANGE, INCHES _____			
IMPELLER _____ TYPE _____ OD" _____ NO. BLADES _____			
REMOVABLE FROM SHAFT YES <input type="checkbox"/> NO <input type="checkbox"/>			
ADDITIONAL DATA _____			

REMARKS	

105\09\101\204\84572015.006\WP51\125833.22pm	SAFETY CLASSIFICATION 3 IMPACT LEVEL _____
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P33B-14583

ATTACHMENT A



FLUOR DANIEL

DATA SHEET

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

AGITATOR

NO. △ △ △ △ △ △	BY DATE	REVISION	SHEET NO. P33B-DS-4	REV 0
			DATE 03-20-80	CONTRACT 845734
			TAG NO. AG-520-004	
			SPECIFICATION SECT NO. 14583	
			ORIG BY HBJO	CHK'D SSL
			APPR'D	

SERVICE FLOOR DRAIN SAMPLING TANK AGITATOR (TK-520-005)
NO. UNITS 1 TYPE: PORTABLE SIDE ENTERING TOP ENTERING ☒ BTM ENTERING

MATERIALS TO BE MIXED

BATCH ☒CONTINUOUS ☐

COMPONENT	QUANTITY - LBS	VISCOSITY - Cp	SP GRAVITY	°F	PSIG
CASE 1. WASTE WATER	20400	0.98	0.9980	77	-0.1
CASE 2. 50% wt SODIUM HYDROXIDE SOLUTION (ACCIDENT CASE)	31000	85	1.52	77	-0.1
FINAL MIX (NOT APPLICABLE)					

CLASS OF AGITATION: BLEND ☒ DISSOLVE ☐ DISPENSE GAS ☐ SUSPEND SOLIDS ☐ HEAT EXCHANGE ☐ EMULSIFY ☐
OTHER HOMOGENIZE PRIOR TO SAMPLING FOAMING YES ☐ NO ☒
DEGREE OF AGITATION: MILD ☐ MEDIUM ☒ VIOLENT ☐
TOO MUCH AGITATION WILL RESULT IN SPLASHING
TOO LITTLE AGITATION WILL RESULT IN SETTLING OF PARTICULATES
IF BATCH, LARGEST OR LEVEL BATCH IS 2500 GALLONS SMALLEST 1250 GALLONS
MIXER SHALL BE DESIGNED TO 2500 GALLONS IN 10 MINUTES

MIXER WILL ☒ WILL NOT ☐ BE OPERATED WHILE FILLING OR DRAWING OFF
VESSEL: OPEN TOP ☐ CLOSED TOP ☒ HORIZ ☐ VERTICAL ☒ API TANK ☐
SIZE: 7'-0" I.D. * X 8'-6" STRAIGHT SIDE OR LENGTH "

BOTTOM TYPE: FLAT ☐ FLANGED AND DISHED ☐ 2:1 SEMI-ELLIPTICAL ☒ CONE ☐
TOP TYPE: FLAT ☒ FLANGED AND DISHED ☐ 2:1 SEMI-ELLIPTICAL ☐
MIXER MOUNTING FLANGE: SIZE 14" RATING ANSI 150# RF

LOCATION AGITATOR MOUNTING FLANGE TOP
DESIGN PRESSURE 5-5 PSIG DESIGN TEMPERATURE 150 °F

BAFFLES: NO 4 WIDTH IN LENGTH IN VERTICAL ☒ HORIZONTAL ☐
MIXER: MOTOR DRIVE: AC ☒ DC ☐ EXP PROOF ☐ TEFC ☒ D.P. ☐
3 PHASE 60 CYCLE 460 VOLTS

SHAFT SEAL: MECHANICAL ☒ PACKING ☐ TYPE LUBRICATION 14"
SIZE OPENING FOR IMPELLER INSTALLATION

HEAD ROOM ABOVE VESSEL FOR INSTALLING MIXER

MATERIALS OF CONSTRUCTION WETTED PARTS 304L SS

MINIMUM AGMA SERVICE FACTOR FOR GEAR REDUCER MINIMUM BEARING LIFE (L-10)

DATA BY VENDOR

MIXER MODEL NO.
DRIVE: HORSEPOWER RPM MFGR
GEAR: RATIO AGMA RATING OUTPUT RPM MFGR
SHAFT COUPLING: DESCRIBE
MECHANICAL SEAL: DESCRIBE
STUFFING BOX: DESCRIBE
SHAFT: OD" LENGTH FROM MOUNTING FLANGE, INCHES
IMPELLER TYPE OD" NO. BLADES REMOVABLE FROM SHAFT YES ☐ NO ☐
ADDITIONAL DATA

REMARKS

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SAFETY CLASSIFICATION 3
IMPACT LEVEL

P33B-14583

943202.0627



FLUOR DANIEL

DATA SHEET

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

AGITATOR

NO.	BY DATE	REVISION	SHEET NO.		REV.
▲			P33B-DS-5		0
▲			DATE	CONTRACT	
▲			03-20-90	845734	
▲			TAG NO.		
▲			AG-520-005		
▲			SPECIFICATION SECT NO.		
▲			14583		
▲			ORIG BY	CHK'D	APPR'D
▲			HBJO	SSL	

SERVICE _____ **REGULATED DRAINS CATCH TANK AGITATOR (TK-520-002)**

NO. UNITS 1 TYPE: PORTABLE SIDE ENTERING TOP ENTERING X BTM ENTERING

MATERIALS TO BE MIXED

BATCH 

CONTINUOUS ☐

COMPONENT	QUANTITY - LBS	VISCOSITY - Cp	SP GRAVITY	°F	PSIG
WASTE WATER	5750	0.98	0.9980	70	-0.1
FINAL MIX					

CLASS OF AGITATION: BLEND ☒ DISSOLVE ☐ DISPENSE GAS ☐ SUSPEND SOLIDS ☐ HEAT EXCHANGE ☐ EMULSIFY ☐
OTHER HOMOGENIZE FOAMING YES ☐ NO ☒

DEGREE OF AGITATION: MILD ☐ MEDIUM ☒ VIOLENT ☐

TOO MUCH AGITATION WILL _____ CAUSE EXCESSIVE SPLASHING

TOO LITTLE AGITATION WILL CAUSE SETTLING OF SUSPENDED PARTICULATES

IF BATCH, LARGEST OR LEVEL BATCH IS 890 GALLONS

SMALLEST

MIXER SHALL BE DESIGNED TO HOMOGENIZE 800 GALLONS IN 10 MINUTES

MXER WILL ☒ WILL NOT ☐ BE OPERATED WHILE FILLING OR DRAWING OFF

VESSEL: OPEN TOP ☐ CLOSED TOP ☒ HORIZ ☐ VERTICAL ☒ API TANK ☐

SIZE: 5'-0" I.D. " X 8'-0" STRAIGHT SIDE OR _____ LENGTH "

BOTTOM TYPE: **FLAT** ☐ **FLANGED AND DISHED** ☐ **2:1 SEMI-ELLIPTICAL** ☒ **CONE** ☐

TOP TYPE: FLAT ☒ FLANGED AND DISHED ☐ 2:1 SEMI-ELLIPTICAL ☐

MIXER MOUNTING FLANGE: SIZE 12" RATING ANSI 150# RF

LOCATION AGITATOR MOUNTING FLANGE _____ TOP

DESIGN PRESSURE 5/5 PSIG DESIGN TEMPERATURE 150 °F

BAFFLES: NO 4 WIDTH _____ IN LENGTH _____ IN VERTICAL ☒ HORIZONTAL ☐

MIXER: MOTOR DRIVE: AC ☒ DC ☐ EXP PROOF ☐ TEFC ☒ D.P. ☐

3 PHASE 60 CYCLE 460 VOLTS

SHAFT SEAL: MECHANICAL ☒ PACKING ☐ TYPE LUBRICATION

SIZE OPENING FOR IMPELLER INSTALLATION _____ 12

HEAD ROOM ABOVE VESSEL FOR INSTALLING MIXER

MATERIALS OF CONSTRUCTION WETTED PARTS 304L SS

MINIMUM AGMA SERVICE FACTOR FOR GEAR REDUCER _____ MINIMUM BEARING LIFE (L-10) _____

DATA BY VENDOR

MIXER MODEL NO.

DRIVE: _____ HORSEPOWER _____ RPM _____

GEAR: _____ RATIO _____ AGMA RATING _____ OUTPUT RPM _____

SHAFT COUPLING: DESCRIBE _____

MECHANICAL SEAL: DESCRIBE _____

STUFFING BOX: DESCRIBE _____

SHAFT: _____ OD" _____ LENGTH FROM MOUNTING FLANGE, INCHES

IMPELLER _____ TYPE _____ OD" _____ NO. BLADES _____ REMOVABLE FROM SHAFT YES ☐ NO ☐

ADDITIONAL DATA _____ REMOVABLE FROM SHAFT YES ☐ NO ☐

REMARKS

ATTACHMENT A

FLUOR DANIEL DATA SHEET U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 AGITATOR	NO.	BY DATE	REVISION	SHEET NO. P33B-DS-6	REV 0
	▲				
	▲				
	▲				
	▲				
	▲				
				DATE 03-01-89	CONTRACT 845734
				TAG NO. AG-540-003	
				SPECIFICATION SECT NO 14583	
				ORIG BY J. Janzen	CHK'D SSL
				APPR'D	

SERVICE OFFGAS TREATMENT CHEMICAL FEED TANK AGITATOR (TK-540-004)
 NO. UNITS 1 TYPE: PORTABLE SIDE ENTERING TOP ENTERING X BTM ENTERING

MATERIALS TO BE MIXED		BATCH <input checked="" type="checkbox"/>	CONTINUOUS <input type="checkbox"/>
COMPONENT	QUANTITY - LBS	VISCOSITY - Cp	SP GRAVITY
OFFGAS TREATMENT			
CHEMICAL SOLUTION		0.88	1.0
FINAL MIX		0.88	1.0

CLASS OF AGITATION: BLEND ☐ DISSOLVE ☒ DISPENSE GAS ☐ SUSPEND SOLIDS ☐ HEAT EXCHANGE ☐ EMULSIFY ☐
 OTHER PREVENT PRECIPITATION FOAMING YES ☐ NO ☒

DEGREE OF AGITATION: MILD ☒ MEDIUM ☐ VIOLENT ☐
 TOO MUCH AGITATION WILL RESULT IN SPLASHING
 TOO LITTLE AGITATION WILL DELAY TO DISSOLVE CHEMICAL(S)

IF BATCH, LARGEST OR LEVEL BATCH IS 500 GALLONS SMALLEST 200 GALLONS

MIXER SHALL BE DESIGNED TO DISSOLVE OFFGAS TREATMENT CHEMICAL(S) IN WATER IN 10 MINUTES

MIXER WILL ☒ WILL NOT ☐ BE OPERATED WHILE FILLING OR DRAWING OFF

VESSEL: OPEN TOP ☐ CLOSED TOP ☒ HORIZ ☐ VERTICAL ☒ API TANK ☐
 SIZE: 4'-6" I.D. " X 5'-0" (TM) STRAIGHT SIDE OR LENGTH "

BOTTOM TYPE: FLAT ☐ FLANGED AND DISHED ☐ 2:1 SEMI-ELLIPTICAL ☒ CONE ☐
 TOP TYPE: FLAT ☐ FLANGED AND DISHED ☐ 2:1 SEMI-ELLIPTICAL ☒
 MIXER MOUNTING FLANGE: SIZE 12" RATING ANSI 150# RF

LOCATION AGITATOR MOUNTING FLANGE TOP

DESIGN PRESSURE -5/5 PSIG DESIGN TEMPERATURE 150 °F

BAFFLES: NO 0 WIDTH IN LENGTH IN VERTICAL ☐ HORIZONTAL ☐

MIXER: MOTOR DRIVE: AC ☒ DC ☐ EXP PROOF ☐ TEFC ☒ D.P. ☐
3 PHASE 60 CYCLE 460 VOLTS

SHAFT SEAL: MECHANICAL ☒ PACKING ☐ TYPE LUBRICATION

SIZE OPENING FOR IMPELLER INSTALLATION 12"

HEAD ROOM ABOVE VESSEL FOR INSTALLING MIXER

MATERIALS OF CONSTRUCTION WETTED PARTS 304L SS

MINIMUM AGMA SERVICE FACTOR FOR GEAR REDUCER MINIMUM BEARING LIFE (L-10)

DATA BY VENDOR

MIXER MODEL NO.
 DRIVE: HORSEPOWER RPM MFR
 GEAR: RATIO AGMA RATING OUTPUT RPM MFR
 SHAFT COUPLING: DESCRIBE
 MECHANICAL SEAL: DESCRIBE
 STUFFING BOX: DESCRIBE
 SHAFT: OD" LENGTH FROM MOUNTING FLANGE, INCHES
 IMPELLER TYPE OD" NO. BLADES REMOVABLE FROM SHAFT YES ☐ NO ☐
 ADDITIONAL DATA

REMARKS

105\OS\101\204\84572011.002\WP51\125833:29pm SAFETY CLASSIFICATION 3
 IMPACT LEVEL

P33B-14583

9413202.0629

ATTACHMENT A



FLUOR DANIEL

DATA SHEET

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

AGITATOR

NO.	BY DATE	REVISION	SHEET NO.	REV.	
			P33B-DS-7	0	
			DATE	CONTRACT	
			03-01-89	845734	
			TAG NO.	AG-540-005	
			SPECIFICATION SECT NO.	14583	
			ORIG BY	CHK'D	APPR'D
			J. Janzen	SSL	

SERVICE KOH/FRIT MODIFIER FEED TANK AGITATOR (TK-540-006)
NO. UNITS 1 TYPE: PORTABLE SIDE ENTERING TOP ENTERING X BTM ENTERING

MATERIALS TO BE MIXED

BATCH ☐CONTINUOUS ☒

COMPONENT	QUANTITY - LBS	VISCOSITY - Cp	SP GRAVITY	°F	PSIG
POTASSIUM HYDROXIDE/	6396	9.5	1.53	77	-0.1
FRIT MODIFIER SOLUTION					
FINAL MIX	51.7% KOH	6396	9.5	77	-0.1

CLASS OF AGITATION: BLEND ☐ DISSOLVE ☒ DISPENSE GAS ☐ SUSPEND SOLIDS ☐ HEAT EXCHANGE ☐ EMULSIFY ☐
OTHER PREVENT PRECIPITATION FOAMING YES ☐ NO ☒

DEGREE OF AGITATION: MILD ☒ MEDIUM ☐ VIOLENT ☐
TOO MUCH AGITATION WILL RESULT IN SPLASHING

TOO LITTLE AGITATION WILL DELAY TO DISSOLVE CHEMICALS

IF BATCH, LARGEST OR LEVEL BATCH IS 500 GALLONS SMALLEST 200 GALLONS

MIXER SHALL BE DESIGNED TO DISSOLVE KOH/FRIT MODIFIER IN WATER IN 10 MINUTES

MIXER WILL ☒ WILL NOT ☐ BE OPERATED WHILE FILLING OR DRAWING OFF

VESSEL: OPEN TOP ☐ CLOSED TOP ☒ HORIZ ☐ VERTICAL ☒ API TANK ☐
SIZE: 4'-6" I.D. " X 5'-0" (T/M) STRAIGHT SIDE OR LENGTH "

BOTTOM TYPE: FLAT ☐ FLANGED AND DISHED ☐ 2:1 SEMI-ELLIPTICAL ☒ CONE ☐

TOP TYPE: FLAT ☐ FLANGED AND DISHED ☐ 2:1 SEMI-ELLIPTICAL ☒

MIXER MOUNTING FLANGE: SIZE 12" RATING ANSI 150# RF

LOCATION AGITATOR MOUNTING FLANGE TOP

DESIGN PRESSURE -5/5 PSIG DESIGN TEMPERATURE 150 °F

BAFFLES: NO 0 WIDTH IN LENGTH IN VERTICAL ☐ HORIZONTAL ☐

MIXER: MOTOR DRIVE: AC ☒ DC ☐ EXP PROOF ☐ TEFC ☒ D.P. ☐
3 PHASE 60 CYCLE 460 VOLTS

SHAFT SEAL: MECHANICAL ☒ PACKING ☐ TYPE LUBRICATION

SIZE OPENING FOR IMPELLER INSTALLATION 12"

HEAD ROOM ABOVE VESSEL FOR INSTALLING MIXER

MATERIALS OF CONSTRUCTION WETTED PARTS 316L SS

MINIMUM AGMA SERVICE FACTOR FOR GEAR REDUCER MINIMUM BEARING LIFE (L-10)

DATA BY VENDOR

MIXER MODEL NO.
DRIVE: HORSEPOWER RPM MFR
GEAR: RATIO AGMA RATING OUTPUT RPM MFR
SHAFT COUPLING: DESCRIBE
MECHANICAL SEAL: DESCRIBE
STUFFING BOX: DESCRIBE
SHAFT: OD" LENGTH FROM MOUNTING FLANGE, INCHES
IMPELLER TYPE OD" NO. BLADES REMOVABLE FROM SHAFT YES ☐ NO ☐
ADDITIONAL DATA

REMARKS

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ATTACHMENT A

<p style="text-align: center;">DATA SHEET</p> <p>U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838</p> <p style="text-align: center;">AGITATOR</p>	NO.	BY DATE	REVISION	SHEET NO. P33B-DS-8	REV. 0
	▲				
	▲				
	▲				
	▲				
	▲				

SERVICE <u>SODIUM NITRITE FEED TANK AGITATOR (TK-540-021)</u>					
NO. UNITS <u>1</u>	TYPE: PORTABLE	SIDE ENTERING	TOP ENTERING <u>X</u>	BTM ENTERING	

MATERIALS TO BE MIXED					
COMPONENT	QUANTITY - LBS	VISCOSITY - Cp	SP GRAVITY	°F	PSIG
SODIUM NITRITE SOLUTION	2967	2.1	1.14	77	-0.1
FINAL MIX <u>20% wt SNK</u>	2967	1.5	1.14	77	-0.1

CLASS OF AGITATION: BLEND ☐ DISSOLVE ☒ DISPENSE GAS ☐ SUSPEND SOLIDS ☐ HEAT EXCHANGE ☐ EMULSIFY ☐
 OTHER PREVENT PRECIPITATION FOAMING YES ☐ NO ☒

DEGREE OF AGITATION: MILD ☒ MEDIUM ☐ VIOLENT ☐
 TOO MUCH AGITATION WILL RESULT IN SPLASHING
 TOO LITTLE AGITATION WILL DELAY TO DISSOLVE CHEMICAL

IF BATCH, LARGEST OR LEVEL BATCH IS 500 GALLONS SMALLEST 200 GALLONS
 MIXER SHALL BE DESIGNED TO DISSOLVE SODIUM NITRITE IN WATER IN 10 MINUTES

MIXER WILL ☒ WILL NOT ☐ BE OPERATED WHILE FILLING OR DRAWING OFF

VESSEL: OPEN TOP ☐ CLOSED TOP ☒ HORIZ ☐ VERTICAL ☒ API TANK ☐
 SIZE: 4'-6" I.D. " X 5'-0" (TT) STRAIGHT SIDE OR _____ LENGTH " _____

BOTTOM TYPE: FLAT ☐ FLANGED AND DISHED ☐ 2:1 SEMI-ELLIPTICAL ☒ CONE ☐
 TOP TYPE: FLAT ☐ FLANGED AND DISHED ☐ 2:1 SEMI-ELLIPTICAL ☒
 MIXER MOUNTING FLANGE: SIZE 12" RATING ANSI 150# RF

LOCATION AGITATOR MOUNTING FLANGE TOP
 DESIGN PRESSURE -5/5 PSIG DESIGN TEMPERATURE 150 °F

BAFFLES: NO 0 WIDTH _____ IN LENGTH _____ IN VERTICAL ☐ HORIZONTAL ☐

MIXER: MOTOR DRIVE: AC ☒ DC ☐ EXP PROOF ☐ TEFC ☒ D.P. ☐
3 PHASE 60 CYCLE 480 VOLTS

SHAFT SEAL: MECHANICAL ☒ PACKING ☐ TYPE LUBRICATION _____
 SIZE OPENING FOR IMPELLER INSTALLATION 12"

HEAD ROOM ABOVE VESSEL FOR INSTALLING MIXER _____
 MATERIALS OF CONSTRUCTION WETTED PARTS 304L SS
 MINIMUM AGMA SERVICE FACTOR FOR GEAR REDUCER _____ MINIMUM BEARING LIFE (L-10) _____

DATA BY VENDOR	
MIXER MODEL NO. _____	
DRIVE: _____ HORSEPOWER _____ RPM _____	MFGR _____
GEAR: _____ RATIO _____ AGMA RATING _____ OUTPUT RPM _____	MFGR _____
SHAFT COUPLING: DESCRIBE _____	
MECHANICAL SEAL: DESCRIBE _____	
STUFFING BOX: DESCRIBE _____	
SHAFT: _____ OD" _____ LENGTH FROM MOUNTING FLANGE, INCHES _____	
IMPELLER _____ TYPE _____ OD" _____ NO. BLADES _____	REMOVABLE FROM SHAFT YES <input type="checkbox"/> NO <input type="checkbox"/>
ADDITIONAL DATA _____	

REMARKS	

105\OS\101\204\84572018.008\WP51\125633.48pm	SAFETY CLASSIFICATION <u>3</u> IMPACT LEVEL _____
--	--

P33B-14583

ATTACHMENT A



FLUOR DANIEL

DATA SHEET

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

AGITATOR

NO.	BY DATE	REVISION	SHEET NO.	REV
△			P33B-DS-9	0
△			DATE	CONTRACT
△			03-02-89	845734
△			TAG NO.	
△			AG-540-014	
△			SPECIFICATION SECT NO.	
△			14583	
△			ORIG BY	CHK'D
△			J. Janzen	SSL
△			APPR'D	

SERVICE DIATOMACEOUS EARTH SLURRY FEED TANK AGITATOR (TK-540-027)
 NO. UNITS 1 TYPE: PORTABLE SIDE ENTERING TOP ENTERING X BTM ENTERING

MATERIALS TO BE MIXED

BATCH ☒CONTINUOUS ☐

COMPONENT	QUANTITY - LBS	VISCOSITY - Cp	SP GRAVITY	°F	PSIG
DIATOMACEOUS EARTH	35	0	—	—	—
PROCESS WATER	665	0.96	1.0	77	-0.1
FINAL MIX	5% wt DES 700	1.11	1.024	77	-0.1

CLASS OF AGITATION: BLEND ☐ DISSOLVE ☐ DISPENSE GAS ☐ SUSPEND SOLIDS ☒ HEAT EXCHANGE ☐ EMULSIFY ☐
 OTHER FOAMING YES ☐ NO ☒

DEGREE OF AGITATION: MILD ☐ MEDIUM ☒ VIOLENT ☐

TOO MUCH AGITATION WILL RESULT IN SPLASHING

TOO LITTLE AGITATION WILL ALLOW DE TO SETTLE

IF BATCH, LARGEST OR LEVEL BATCH IS 150 GALLONS SMALLEST 20 GALLONS

MIXER SHALL BE DESIGNED TO BLEND DIATOMACEOUS EARTH IN WATER IN 10 MINUTES

MIXER WILL ☒ WILL NOT ☐ BE OPERATED WHILE FILLING OR DRAWING OFF

VESSEL: OPEN TOP ☐ CLOSED TOP ☒ HORIZ ☐ VERTICAL ☒ API TANK ☐

SIZE: 3'-0" I.D. " X 3'-0" STRAIGHT SIDE OR LENGTH "

BOTTOM TYPE: FLAT ☐ FLANGED AND DISHED ☐ 2:1 SEMI-ELLIPTICAL ☐ CONE ☒

TOP TYPE: FLAT ☒ FLANGED AND DISHED ☐ 2:1 SEMI-ELLIPTICAL ☐

MIXER MOUNTING FLANGE: SIZE 12" RATING ANSI 150# RF

LOCATION AGITATOR MOUNTING FLANGE TOP

DESIGN PRESSURE -5/5 PSIG DESIGN TEMPERATURE 150 °F

BAFFLES: NO 0 WIDTH IN LENGTH IN VERTICAL ☐ HORIZONTAL ☐

MIXER: MOTOR DRIVE: AC ☒ DC ☐ EXP PROOF ☐ TEFC ☒ D.P. ☐
3 PHASE 60 CYCLE 480 VOLTS

SHAFT SEAL: MECHANICAL ☒ PACKING ☐ TYPE LUBRICATION

SIZE OPENING FOR IMPELLER INSTALLATION 12"

HEAD ROOM ABOVE VESSEL FOR INSTALLING MIXER

MATERIALS OF CONSTRUCTION WETTED PARTS 304L SS

MINIMUM AGMA SERVICE FACTOR FOR GEAR REDUCER MINIMUM BEARING LIFE (L-10)

DATA BY VENDOR

MIXER MODEL NO.
 DRIVE: HORSEPOWER RPM MFR
 GEAR: RATIO AGMA RATING OUTPUT RPM MFR
 SHAFT COUPLING: DESCRIBE
 MECHANICAL SEAL: DESCRIBE
 STUFFING BOX: DESCRIBE
 SHAFT: OD" LENGTH FROM MOUNTING FLANGE, INCHES
 IMPELLER TYPE OD" NO. BLADES REMOVABLE FROM SHAFT YES ☐ NO ☐
 ADDITIONAL DATA

REMARKS

P33B-14583

ATTACHMENT A



FLUOR DANIEL

DATA SHEET

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

AGITATOR

NO.	BY DATE	REVISION	SHEET NO.	REV.
			P33B-DS-11	0
			DATE	CONTRACT
			04-23-91	845734
			TAG NO.	AG-540-018
			SPECIFICATION SECT NO.	14583
		ORIG BY	CHK'D	APPR'D
		Q.B. Ngo	SSL	

SERVICE ANTIFOAM FEED TANK AGITATOR (TK-540-034)
NO. UNITS 1 TYPE: PORTABLE SIDE ENTERING TOP ENTERING X BTM ENTERING

MATERIALS TO BE MIXED

BATCH ☐CONTINUOUS ☐

COMPONENT	QUANTITY - LBS	VISCOSITY - Cp	SP GRAVITY	°F	PSIG
SILICON GLYCOL COMPOUND	210	2000-4000	1.03	77	
PROCESS WATER	1880	0.98	1.0	70	
FINAL MIX	10% wt antifoam	2080	1.0	77	ATM.

CLASS OF AGITATION: BLEND ☒ DISSOLVE ☐ DISPENSE GAS ☐ SUSPEND SOLIDS ☐ HEAT EXCHANGE ☐ EMULSIFY ☐
OTHER FOAMING YES ☐ NO ☒

DEGREE OF AGITATION: MILD ☒ MEDIUM ☐ VIOLENT ☐

TOO MUCH AGITATION WILL TOO LITTLE AGITATION WILL

IF BATCH, LARGEST OR LEVEL BATCH IS 210 GALLONS SMALLEST 50 GALLONS
MIXER SHALL BE DESIGNED TO IN MINUTES

MIXER WILL ☒ WILL NOT ☐ BE OPERATED WHILE FILLING OR DRAWING OFF

VESSEL: OPEN TOP ☐ CLOSED TOP ☒ HORIZ ☐ VERTICAL ☒ API TANK ☐
SIZE: 3'-0" I.D. " X 4'-0" TIT STRAIGHT SIDE OR LENGTH "

BOTTOM TYPE: FLAT ☐ FLANGED AND DISHED ☐ 2:1 SEMI-ELLIPTICAL ☒ CONE ☐

TOP TYPE: FLAT ☐ FLANGED AND DISHED ☐ 2:1 SEMI-ELLIPTICAL ☒

MIXER MOUNTING FLANGE: SIZE 6" RATING ANSI 150# RF

LOCATION AGITATOR MOUNTING FLANGE TOP

DESIGN PRESSURE -5/5 PSIG DESIGN TEMPERATURE 150 °F

BAFFLES: NO 0 WIDTH IN LENGTH IN VERTICAL ☐ HORIZONTAL ☐

MIXER: MOTOR DRIVE: AC ☒ DC ☐ EXP PROOF ☐ TEFC ☒ D.P. ☐
3 PHASE 60 CYCLE 460 VOLTS

SHAFT SEAL: MECHANICAL ☒ PACKING ☐ TYPE LUBRICATION

SIZE OPENING FOR IMPELLER INSTALLATION 12"

HEAD ROOM ABOVE VESSEL FOR INSTALLING MIXER

MATERIALS OF CONSTRUCTION WETTED PARTS 304L SS

MINIMUM AGMA SERVICE FACTOR FOR GEAR REDUCER MINIMUM BEARING LIFE (L-10)


DATA BY VENDOR

MIXER MODEL NO.
DRIVE: HORSEPOWER RPM MFGR
GEAR: RATIO AGMA RATING OUTPUT RPM MFGR
SHAFT COUPLING: DESCRIBE
MECHANICAL SEAL: DESCRIBE
STUFFING BOX: DESCRIBE
SHAFT: OD" LENGTH FROM MOUNTING FLANGE, INCHES
IMPELLER TYPE OD" NO. BLADES REMOVABLE FROM SHAFT YES ☐ NO ☐
ADDITIONAL DATA

REMARKS

9413202.0634

ATTACHMENT A

 FLUOR DANIEL DATA SHEET U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 AGITATOR	NO.	BY	REVISION	SHEET NO.	REV.
		DATE		P33B-DS-12	0
	△			DATE	CONTRACT
	△			04-03-89	845734
	△			TAG NO.	
	△			AG-580-003	
△			SPECIFICATION SECT NO.		
△			14583		
△			ORIG BY	CHK'D	APPR'D
△			M. Feldon	RMM	

SERVICE DECON FRIT SLURRY FEED TANK AGITATOR (TK-580-003)
 NO. UNITS 1 TYPE: PORTABLE SIDE ENTERING TOP ENTERING X BTM ENTERING

MATERIALS TO BE MIXED					
		BATCH <input checked="" type="checkbox"/>	CONTINUOUS <input type="checkbox"/>		
COMPONENT	QUANTITY - LBS	VISCOSITY - Cp	SP GRAVITY	°F	PSIG
GLASS FRIT	567		2.5	77	
FORMIC ACID	5,818		1.1	77	
WATER	6,497		1.0	77	
FINAL MIX	7070	1.1	1.045		

CLASS OF AGITATION: BLEND ☐ DISSOLVE ☐ DISPENSE GAS ☐ SUSPEND SOLIDS ☒ HEAT EXCHANGE ☐ EMULSIFY ☐
 OTHER _____ FOAMING YES ☐ NO ☒

DEGREE OF AGITATION: MILD ☐ MEDIUM ☒ VIOLENT ☐
 TOO MUCH AGITATION WILL CAUSE EXCESSIVE WEAR
 TOO LITTLE AGITATION WILL ALLOW FRIT TO SETTLE OUT

IF BATCH, LARGEST OR LEVEL BATCH IS 800 GALLONS SMALLEST 300 GALLONS
 MIXER SHALL BE DESIGNED TO PROVIDE SLURRY UNIFORMITY TO THE BATCH HEIGHT IN _____ MINUTES

MIXER WILL ☒ WILL NOT ☐ BE OPERATED WHILE FILLING OR DRAWING OFF

VESSEL: OPEN TOP ☐ CLOSED TOP ☒ HORIZ ☐ VERTICAL ☒ API TANK ☐
 SIZE: 72" I.D. " X 72" STRAIGHT SIDE OR _____ LENGTH "

BOTTOM TYPE: FLAT ☐ FLANGED AND DISHED ☐ 2:1 SEMI-ELLIPTICAL ☒ CONE ☐
 TOP TYPE: FLAT ☐ FLANGED AND DISHED ☐ 2:1 SEMI-ELLIPTICAL ☒
 MIXER MOUNTING FLANGE: SIZE 24" RATING ANSI 150# RF

LOCATION AGITATOR MOUNTING FLANGE TOP
 DESIGN PRESSURE +5" wgt/1.0 PSIG DESIGN TEMPERATURE 150 °F

BAFFLES: NO 4 WIDTH _____ IN LENGTH _____ IN VERTICAL ☒ HORIZONTAL ☐

MIXER: MOTOR DRIVE: AC ☒ DC ☐ EXP PROOF ☐ TEFC ☒ D.P. ☐
3 PHASE 60 CYCLE 460 VOLTS

SHAFT SEAL: MECHANICAL ☐ PACKING ☐ TYPE LUBRICATION N/A
 SIZE OPENING FOR IMPELLER INSTALLATION _____
 HEAD ROOM ABOVE VESSEL FOR INSTALLING MIXER _____
 MATERIALS OF CONSTRUCTION WETTED PARTS 316L SS
 MINIMUM AGMA SERVICE FACTOR FOR GEAR REDUCER _____ MINIMUM BEARING LIFE (L-10) _____

DATA BY VENDOR

MIXER MODEL NO. _____
 DRIVE: _____ HORSEPOWER _____ RPM _____ MFGR _____
 GEAR: _____ RATIO _____ AGMA RATING _____ OUTPUT RPM _____ MFGR _____
 SHAFT COUPLING: DESCRIBE _____
 MECHANICAL SEAL: DESCRIBE _____
 STUFFING BOX: DESCRIBE _____
 SHAFT: _____ OD" _____ LENGTH FROM MOUNTING FLANGE, INCHES
 IMPELLER _____ TYPE _____ OD" _____ NO. BLADES _____ REMOVABLE FROM SHAFT YES ☐ NO ☐
 ADDITIONAL DATA _____

REMARKS

FRIT IS -80 TO +200 MESH - STD. DISTRIBUTION
 SLURRY IS PREPARED BY ADDING WATER TO 60% SLURRY FROM F5MT
 SELLER TO PROVIDE IN-TANK SHAFT COUPLING

SAFETY CLASSIFICATION 3
 IMPACT LEVEL _____

Rev. 0

**ATTACHMENT B
EQUIPMENT MAXIMUM ENVELOPE AND MODEL NUMBER OR EQUAL**

TAG NUMBER	MODEL NUMBER	MAXIMUM ENVELOPE (Inches)		
		LENGTH	WIDTH	HEIGHT
AG-520-001	Philadelphia Mixers PMV-01	26	26	156
AG-520-002	Philadelphia Mixers PMG-2	20	20	123
AG-520-003	Philadelphia Mixers PMG-2	20	20	123
AG-520-004	Philadelphia Mixers PMV-01	26	26	156
AG-520-005	Philadelphia Mixers PMG-15	20	20	138
AG-540-003	Philadelphia Mixers PMG-15	20	20	116
AG-540-005	Philadelphia Mixers PMG-2	20	20	118
AG-540-012	Philadelphia Mixers PMG-15	20	20	116
AG-540-014	Philadelphia Mixers PMG-34	20	20	84
AG-540-016	Philadelphia Mixers PMG-15	20	20	116
AG-540-018	Philadelphia Mixers PMG-12	12	12	94
AG-580-003	Philadelphia Mixers MTE-70S-PTSS	34	34	150

* Equipment shall be of this model number or equal.

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U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 14584W
COLD FEED AGITATOR
B-595-P-P33B-14584W

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA YES X NO
QUALITY LEVEL I X II
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

CHECKER:

F. Bizjak
F. Bizjak, Mechanical Engineer
1/26/93
Date

D. A. Buzzelli
D. A. Buzzelli, Lead Disc. Checker
1-26-93
Date

APPROVED BY:

R. B. Erickson
C. J. Divona Lead Discipline Engineer

1-26-93
Date

SECTION 14584W
COLD FEED AGITATOR
B-595-P-P33B-14584W

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ATTACHMENTS

<u>ATTACHMENTS</u>	<u>TITLE</u>
A	AGITATOR DATA SHEET
B	EQUIPMENT MAXIMUM ENVELOPE AND MODEL NUMBER OR EQUAL

9413202.0638

**SECTION 14584W
COLD FEED AGITATOR**

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the design, materials, fabrication, quality, inspection, testing and delivery requirements of one agitator for use in non-radioactive slurries and chemicals. The requirements outlined herein supplement the agitator data sheet (Attachment A).

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
and/or
AMERICAN GEAR MANUFACTURERS INSTITUTE (AGMA)

ANSI/AGMA 6000 1988 (Rev. A) Specification for
Measurement of Linear Vibration on Gear
Units

ANSI/AGMA 6010 1988 Standard for Spur, Helical,
Herringbone and Bevel Enclosed Drives

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
and/or
AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ANSI/ASME B16.5 1988 Pipe Flanges and Flanged Fittings

ANSI/ASME B46.1 1985 Surface Texture (Surface Roughness,
Waviness, and Lay)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A182/A182M 1991 Standard Specification for Forged or
Rolled Alloy-Steel Pipe Flanges, Forged
Fittings, and Valves and Parts for High-
Temperature Service

ASTM A240 1991 (Rev. A) Standard Specification for
Heat-Resisting Chromium and Chromium-
Nickel Stainless Steel Plate, Sheet, and
Strip for Pressure Vessels

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ASTM A312/A312M	1991 (Rev. B) Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipe
ASTM A479/A479M	1991 (Rev. A) Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels
ASTM A744/A744M	1991 Standard Specification for Castings, Iron-Chromium Nickel, Corrosion Resistant, for Severe Service
ANTI-FRICTION BEARING MANUFACTURERS ASSOCIATION (AFBMA)	
AFBMA 9	1990 Load Ratings and Fatigue Life for Ball Bearings
AFBMA 11	1990 Load Ratings and Fatigue Life for Roller Bearings
OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)	
OSHA Standard Instruction 1-12.14	1978 Guards for Rotating Equipment
STEEL STRUCTURES PAINTING COUNCIL (SSPC)	
SSPC SP-6	1989 Surface Preparation Specification No. 6, Commercial Blast Cleaning
SSPC SP-10	1989 Surface Preparation Specification No. 10, Near-White Blast Cleaning

1.3

RELATED REQUIREMENTS

Specification Section 01730	Operation and Maintenance Data
Specification Section 05066	Welding Specialty Equipment
Specification Section 13252	Precaution for the Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys
Specification Section 15196	Identification and Tagging Methods for Mechanical Equipment
Specification Section 16150	Motors - Induction for General Service

1.4 DEFINITIONS

CMTR - Certified Material Test Report
FAT - Factory Acceptance Test
NDE - Nondestructive Examination
PT - Liquid Penetrant Examination
RPM - Revolutions per Minute
TEFC - Totally Enclosed Fan Cooled

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

- 1.6.1 Assembly and outline drawings of the equipment shall be submitted for Buyer approval. The following information shall be included on or submitted with the drawings:
- A. Two views of the agitator assembly (plan and elevation).
 - B. Cross-section of drive assembly. Cross-section shall show shaft diameter and bearing spans.
 - C. Stuffing box assembly.
 - D. Complete specification, designation and Certified Material Test Reports (CMTRs) of all materials.
 - E. Weight of agitator assembly. This weight shall include the driver, mounting plate and lifting assembly weights. All loads (torque, bending moments) imposed on the vessel nozzle shall be shown. Weights of separate removable parts shall be shown if agitator cannot be removed as a complete assembly. Weights of agitator assembly components (electric motor, reduction gear box and agitator shaft and impeller) shall be shown on the drawings.
 - F. Dimensions. These shall include height, width, maintenance space required, service connection locations, mounting details, mounting flange details, lifting assemblies and other pertinent dimensions with reference to the datum plane (bottom of mounting plate).
 - G. Buyer purchase order and item numbers.
 - H. Bill of materials.

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1.6.2 Instructions for operation, maintenance and storage shall be submitted for Buyer review. These instructions shall incorporate theory of operation, operational adjustments, troubleshooting, instructions for assembly and disassembly and complete parts list with part numbers. Site storage instructions shall include requirements for handling, and short-term and long-term storage. Data shall be submitted in accordance with Specification Section 01730. Complete installation manuals shall also be submitted.

1.6.3 A list of recommended spare parts for one (1) year's routine operation shall be supplied. The spare parts list shall include sufficient data to permit procurement of standard parts from the original manufacturer or any sub-supplier. Seller shall provide a sectional view of the identified parts.

1.6.4 Completed agitator data sheet (Attachment A). Electric motor data sheet (Attachment A) of Specification Section 16150 shall be completed and submitted.

1.6.5 Design Calculations

An engineering design analysis shall be provided. The analysis shall contain supporting calculations used to establish horsepower requirements, shaft sizes, bearing loads, nozzle loads, operational characteristics and technical descriptions. Calculations shall be complete and in sufficient detail to permit second party review. Seller shall establish and guarantee the forces and moments on the agitator nozzle. Lifting eye calculations shall be included.

Seller calculations shall show that the agitator will provide uniform mixing even when reduced to 95% of the impeller area by erosion from the mixed liquid.

1.6.6 Certified Factory Acceptance Test (FAT) procedures, inspection and quality assurance control plan in accordance with Paragraph 2.5.

1.6.7 Certified performance FAT results prior to shipment in accordance with Paragraph 2.5.

1.6.8 Lubrication requirements in accordance with Paragraph 2.2.4.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

A. Site Elevation 714 feet above sea level

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Rev. 0

- B. Barometric Pressure 14.3 psia
- C. Outside Design Temperature
 - 1) Maximum Design Temperature 110°F
 - 2) Minimum Design Temperature -20°F
 - 3) Wet Bulb Design Temperature 68°F

1.8.2 Operating Environment

- A. Normal Temperature 60°F to 104°F
- B. Maximum Temperature 104°F
- C. Relative Humidity Not controlled

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Materials

2.1.1.1 All pipe, fittings, plate, bar, castings and forgings shall be in accordance with ASTM A182/A182M, ASTM A240, ASTM A312/A312M, ASTM A479/A479M and ASTM A744/A744M as applicable. Wet-end components and those components likely to be exposed to vapors of chemicals being handled shall be stainless steel. These include impeller, shaft, outboard bearing, shaft seal housing and mounting flange facing. Type of stainless steel to be used for wetted parts shall be in accordance with Data Sheet P33B-DS-1 (Attachment A).

- A. Seller may utilize standard materials of construction on internal gear reducer, motor, bearing and coupling components. Exterior surfaces of the above components may also be Seller's standard materials of construction.
- B. All other components shall be Seller's standard materials of construction.

2.1.1.2 A design envelope and a model number of the agitator is referenced in Attachment B.

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2.2 FABRICATION AND MANUFACTURE

2.2.1 General Requirements

- 2.2.1.1 The agitator shall provide mixing of components shown on Data Sheet P33B-DS-1 (Attachment A) with respect to class and degree of agitation.
- 2.2.1.2 The equipment shall be designed for mounting on the type of vessel as stated on Data Sheet P33B-DS-1 (Attachment A).
- 2.2.1.3 The equipment shall have a design life of not less than 20 years at the specified conditions. This requirement excludes expendable items such as impellers, bearings, seals and gaskets.
- 2.2.1.4 The agitator will be used for chemical agitation in a nuclear waste processing facility. The agitator shall not, however, be exposed to radiation.
- 2.2.1.5 The agitator shall be Seller's standard low-risk design, modified as required to be in accordance with this specification section.
- 2.2.1.6 The equipment shall be of proven design with a minimum of two years of successful operation in equal or more severe design and operating conditions as outlined in the agitator specification section.
- 2.2.1.7 Seller shall follow the requirements of Specification Section 13252 both prior to and after welding to minimize contamination of stainless steel.

2.2.2 Technical Requirements

- 2.2.2.1 Bearings shall be of the sealed anti-friction type. They shall be in accordance either with AFBMA 9 or AFBMA 11. Bearing L-10 life shall be not less than 100,000 hours. Agitator shall be designed for start-up torques at least double the expected running torques. Bearings shall be fitted with zerk fittings and purge ports.
- 2.2.2.2 The agitator shall be single speed, top entering and flange mounted on a closed tank. The agitator shall be provided with stuffing box and non-lubricated packing as required on Data Sheet P33B-DS-1 (Attachment A). Direction of agitator shaft rotation shall be clockwise looking downward.
- 2.2.2.3 A service factor of not less than 1.5 shall be used in accordance with ANSI/AGMA 6010, Appendix A, Table A-3, unless otherwise specified on Data Sheet P33B-DS-1 (Attachment A). A "Uniform" load classification shall be used. A gear drive shall be either helical or herringbone type in accordance with ANSI/AGMA 6010. AGMA gear quality class shall be 10 or better. Mechanical rating

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shall be not less than 1.5 times the nameplate motor horsepower. Thermal horsepower shall be not less than nameplate motor horsepower. The mixer blade tip speed shall not exceed 800 ft/min. Said mixer blade shall be sized to provide uniform mixing when eroded to 95% of its initial area.

- 2.2.2.4 A shaft shall be sized to withstand forces resulting from starting at maximum tank level and operating in empty tank. Impeller thrust in the fluid shall be downward and shaft thrust shall be upward. Bottom steady bearings shall not be provided. The agitator shaft may be hollow. The shaft's calculated maximum combined shear stress shall be less than 20% of the construction material's tensile yield strength. Shafts shall be straight to within 0.003 in/ft.
- 2.2.2.5 The first critical speed shall be not less than 135 percent of the maximum operating speed.
- 2.2.2.6 All assembly joints shall include alignment or centering fits as required to ensure accurate reassembly of all parts. Shaft and impeller assembly shall be bolted. The assembly shall be secured to prevent impeller blade unbolting. The impeller shaft assembly shall be statically balanced as follows:
- A. Impeller shaft speed up to 125 rpm inclusive to 0.5 ounce-inch per pound of rotating weight.
 - B. Impeller shaft speed from 125-350 rpm to 0.25 ounce-inch per pound of rotating weight.
- 2.2.2.7 The vibration limits shall be in accordance with ANSI/AGMA 6000.
- 2.2.2.8 Pressure-containing components shall be suitable for the design pressure and temperature of the mixing vessel. This requirement includes mounting flanges. Flanges shall be in accordance with ANSI/ASME B16.5. Flange size and rating shall be as specified on Data Sheet P33B-DS-1 (Attachment A). The mounting flange facing shall have a surface finish of 125 RMS in accordance with ANSI/ASME B46.1.
- 2.2.2.9 Seller shall provide a flexible, forged steel coupling between the power drive and the agitator gear drive. Motor to reducer input coupling shall have a service factor of not less than 2.0 based on motor capacity. Inside tank coupling is required for removal of shaft assembly when specified on Data Sheet P33B-DS-1 (Attachment A). Coupling materials shall be compatible with shaft materials.
- 2.2.2.10 Couplings shall be keyed in both shafts. The coupling design shall allow removal of the hub without the need for heating. All exposed rotating parts shall be provided with heavy-duty guards in

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accordance with OSHA Standard Instruction 1-12.14. Guards shall be removable.

2.2.2.11 The agitator design shall include provisions for ensuring that drive and agitator components are aligned during assembly.

2.2.2.12 The design shall be such that bearings, seals, driver and gear units may be replaced without dismantling other major parts. It shall also be possible to replace these parts without emptying or depressuring the vessel.

2.2.3 Shaft Seal

The shaft seal type shall be as specified on Data Sheet P33B-DS-1 (Attachment A). Seal parts shall be inert both to the fluids being mixed and to any lubricant used. Nonmetallic components are included in this requirement. The use of any pressurized external lubrication system shall not be acceptable.

2.2.3.1 Stuffing boxes shall include the following minimum design characteristics:

- A. They shall be an integral part of the cover.
- B. Seal cage design shall allow easy removal.
- C. They shall have not less than 3 rings of packing plus the seal cage.
- D. The design shall allow space to permit packing replacement without removing or dismantling any part other than the gland and seal cage.

2.2.4 Lubrication Requirements

Seller shall submit the lubrication requirements for the agitator on Seller's lubrication data sheet. Lubricants shall be recommended by Seller. Lubricants shall be able to be drained and replenished. A synthetic gear lubricant is preferred.

2.2.5 Electric Motor

2.2.5.1 Seller shall provide the agitator with a totally-enclosed fan-cooled (TEFC) chemical-type motor in accordance with Specification Section 16150. Seller shall complete electric motor data sheet from Specification Section 16150 (Attachment A). Drive motor shall be vertical.

2.2.5.2 The motor thrust bearing shall have a minimum rating of 120 percent of the maximum axial thrust load that can be transmitted to the bearing.

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- 2.2.5.3 The motor shall be single-speed. It is intended that the motor be the weakest link in a high-torque event and that the shaft, impeller blades, etc. do not fail in any such event.
- 2.2.5.4 The motor shall be suitable for continuous duty.
- 2.2.6 Welding
- Welding (if required) shall be in accordance with Specification Section 05066.
- 2.2.7 Painting
- 2.2.7.1 Stainless steel and nickel-based alloy construction materials shall not be painted. All carbon steel exposed surfaces shall be shop-primed and finish-painted in accordance with Seller's standards.
- 2.2.7.2 All machinery and equipment shall have a clean and finished appearance when delivered to Buyer. Prior to painting all surfaces shall be free of dirt, rust, grease, weld spatter, loose mill scale or other deleterious substances. Surfaces to be painted shall be cleaned in accordance either with SSPC SP-6 or SSPC SP-10 in accordance with Seller's surface preparation procedure. The paint type and quality shall be Seller's standard. It shall be applied in accordance with the paint manufacturer's recommended procedures. Colors will be advised by Buyer.
- 2.2.8 Noise
- The noise level shall not exceed 85 dBA at 3 feet periphery around the agitator mounting flange.
- 2.2.9 Performance
- Seller shall guarantee that the agitator is in accordance with all specified operating conditions and is a satisfactory application in all respects to the conditions described both in this specification section and Data Sheet P33B-DS-1 (Attachment A).
- 2.2.10 Lifting Eyes
- 2.2.10.1 Lifting eyes shall be furnished for crane handling. These shall be positioned to give maximum balance with an even weight distribution to minimize handling hazards. Each lifting eye shall be designed to carry twice the lifting load. Agitator lifting assemblies shall be designed and fabricated with two lifting eyes.

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2.3 OPERATING AND DESIGN CONDITIONS

2.3.1 Operating Conditions

2.3.1.1 Refer to Data Sheet P33B-DS-1 (Attachment A) for operating conditions.

2.3.2 Design Conditions

The agitator shall be designed to operate in a process tank under design conditions stated in Data Sheet P33B-DS-1 (Attachment A).

2.4 LABELING

Labeling shall be in accordance with Specification Section 15196. This shall be in addition to the manufacturer's identification plate. The nameplate shall be stamped or embossed with not less than the following information:

Purchase order number
Equipment number
Manufacturer's model number
Rated horsepower
Impeller diameter
Impeller RPM
Materials of construction of wetted parts

The nameplate shall be completely visible after assembly of the equipment.

2.5 TESTING AND INSPECTION

2.5.1 General

2.5.1.1 Seller shall supply Buyer with all certified test data whether witnessed or not. Agitator shall not be shipped until Buyer has reviewed test data. All equipment shall be completely shop-assembled. Locating dimensions of mounting bolt holes shall be verified.

- A. The agitator shall be no-load tested for 15 minutes or until oil temperatures have stabilized. The agitator shall then be tested complete with agitator shaft in accordance with test procedure to be submitted for Buyer approval. The test medium shall be water.
- B. Seller shall provide test procedures that demonstrate the performance characteristics of the agitator (i.e., efficiency, mixing characteristics, horsepower needed, maximum volume capability for mixing designated liquid or

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slurry as specified in Data Sheet P33B-DS-1 (Attachment A).
Test procedures shall be approved by Buyer before use.

- C. Seller shall provide certified results and reports for all FATs performed.
- D. Vibration tests of complete assembly shall be performed in accordance with ANSI/AGMA 6000.

- 2.5.1.2 Seller shall furnish copies of their inspection and quality control plan to Buyer.
- 2.5.1.3 Materials and workmanship shall be subject to inspection by Buyer. Inspection shall take place in Seller's shop.
- 2.5.1.4 At minimum the Buyer's inspector shall check equipment components, tagging, critical installation dimensions, connection sizes, connection locations and quality of workmanship against certified drawings, data and purchase order documents.
- 2.5.1.5 Preparation for shipment shall be subject to inspection.
- 2.5.2 Nondestructive Examination - General
 - 2.5.2.1 Nondestructive Examination (NDE) acceptance criteria of welds shall be in accordance both with Specification Section 05066 and this specification section.
 - 2.5.2.2 All welds shall be 100% radiographically examined. Where it is not physically possible to perform radiographic examination, welds shall be examined by liquid penetrant examination (PT). Where it is not physically possible to radiograph lifting eye welds, 100% of the root and final weld passes shall be PT examined.
- 2.5.3 Final Dimensional Checks

After fabrication and testing Seller shall verify measurements by means of as-built dimension drawings. The procedure selected for final dimensional check shall be submitted for Buyer approval. Buyer may witness Seller's dimensional verification measurements at Buyer's option. Seller shall provide proof that the agitator and agitator appurtenances are dimensionally correct within the specified tolerances in accordance with this specification section.

2.6 PACKAGING

Preparation for shipment and packing may conform to the Seller's standards. At minimum, the packaging shall provide protection against corrosion and damage from normal handling and storage. Minimum preparation shall include the requirements listed below.

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- A. Machined surfaces, threads, bearings and bearing housings shall be protected during shipment by application of grease or other suitable rust-inhibiting compound.
- B. Threaded connections and tapped holes shall be capped or plugged. Compatible materials shall be used to prevent thread damage.
- C. The agitator motor shall be fully protected against moisture penetration to the electrical compartments and winding.
- D. Mechanical seals and other sealing devices shall be installed for shipment.
- E. Bracing, supports and rigging connections shall be provided to prevent damage during shipment, lifting and unloading. Lifting points shall be clearly marked.
- F. Separate or loose parts shall be completely boxed and attached to the main item to be shipped as a unit. All shipping boxes shall be identified by the Seller's order number, equipment number and equipment description.

PART 3 EXECUTION

(Not Used)

END OF SECTION

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ATTACHMENT A



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DATA SHEET

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

AGITATOR

NO.	BY DATE	REVISION	SHEET NO.	REV.	
			P33B-DS-1	0	
			DATE	CONTRACT	
			04-03-89	845734	
			TAG NO.	AG-580-002	
			SPECIFICATION SECT NO.	14584W	
			ORIG BY	CHK'D	APPR'D
			M. Feldon	RMM	

SERVICE PROCESS FRIT SLURRY FEED TANK AGITATOR (TK-580-002)
NO. UNITS ONE TYPE: PORTABLE SIDE ENTERING TOP ENTERING X BTM ENTERING

MATERIALS TO BE MIXED						BATCH	<input checked="" type="checkbox"/>	CONTINUOUS	<input type="checkbox"/>
COMPONENT	QUANTITY - LBS	VISCOSITY - Cp	SP GRAVITY	°F	PSIG				
GLASS FRIT	26,660		2.5	77					
FORMIC ACID	274		1.22	77					
WATER	17,970		1.0	77					
FINAL MIX	44,904	11	1.55						

CLASS OF AGITATION: BLEND ☐ DISSOLVE ☐ DISPENSE GAS ☐ SUSPEND SOLIDS ☒ HEAT EXCHANGE ☐ EMULSIFY ☐
OTHER ☐ FOAMING YES ☐ NO ☒

DEGREE OF AGITATION: MILD ☐ MEDIUM ☒ VIOLENT ☐
TOO MUCH AGITATION WILL CAUSE EXCESSIVE WEAR

TOO LITTLE AGITATION WILL ALLOW FRIT TO SETTLE OUT

IF BATCH, LARGEST OR LEVEL BATCH IS 3600 GALLONS SMALLEST 800 GALLONS

MIXER SHALL BE DESIGNED TO PROVIDE SLURRY UNIFORMITY TO THE BATCH HEIGHT IN MINUTES

MIXER WILL ☒ WILL NOT ☐ BE OPERATED WHILE FILLING OR DRAWING OFF

VESSEL: OPEN TOP ☐ CLOSED TOP ☒ HORIZ ☐ VERTICAL ☒ API TANK ☐
SIZE: 120 I.D. " X 6'-6" STRAIGHT SIDE OR LENGTH "

BOTTOM TYPE: FLAT ☐ FLANGED AND DISHED ☒ 2:1 SEMI-ELLIPTICAL ☐ CONE ☐

TOP TYPE: FLAT ☐ FLANGED AND DISHED ☒ 2:1 SEMI-ELLIPTICAL ☐

MIXER MOUNTING FLANGE: SIZE 24" RATING ANSI 150 # RF

LOCATION AGITATOR MOUNTING FLANGE TOP

DESIGN PRESSURE + 5" WG/-1.0 PSIG DESIGN TEMPERATURE 150 °F

BAFFLES: NO 4 WIDTH IN LENGTH IN VERTICAL ☒ HORIZONTAL ☐

MIXER: MOTOR DRIVE: AC ☒ DC ☐ EXP PROOF ☐ TEFC ☒ D.P. ☐
3 PHASE 60 CYCLE 460 VOLTS

SHAFT SEAL: MECHANICAL ☐ PACKING ☐ STUFFING BOX

SIZE OPENING FOR IMPELLER INSTALLATION

HEAD ROOM ABOVE VESSEL FOR INSTALLING MIXER 51"

MATERIALS OF CONSTRUCTION WETTED PARTS 316L SS

MINIMUM AGMA SERVICE FACTOR FOR GEAR REDUCER MINIMUM BEARING LIFE (L-10)

DATA BY VENDOR

MIXER MODEL NO.

DRIVE: HORSEPOWER RPM MFGR

GEAR: RATIO AGMA RATING OUTPUT RPM MFGR

SHAFT COUPLING: DESCRIBE

MECHANICAL SEAL: DESCRIBE

STUFFING BOX: DESCRIBE

SHAFT: OD" LENGTH FROM MOUNTING FLANGE, INCHES

IMPELLER TYPE OD" NO. BLADES REMOVABLE FROM SHAFT YES ☐ NO ☐

ADDITIONAL DATA

REMARKS

FRIT IS - 80 TO + 200 MESH STD DISTRIBUTION

SLURRY IS PREPARED IN ANOTHER TANK (THE FSMT) & TRANSFERRED TO PFSFT

SELLER TO PROVIDE IN-TANK COUPLING

105\DS\101\204\84572010.001\WP51-012593 SAFETY CLASSIFICATION 3

IMPACT LEVEL

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ATTACHMENT B

EQUIPMENT MAXIMUM ENVELOPE AND MODEL NUMBER OR EQUAL

TAG NUMBER	MODEL NUMBER*	MAXIMUM ENVELOPE (inches)		
		LENGTH	WIDTH	HEIGHT
AG-580-002	Philadelphia Mixers MTE-90S-PTSS	38	38	170

* Equipment shall be of this model number or equal.

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U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 15139
AIR DRIVEN DIAPHRAGM PUMPS
B-595-P-P33B-15139

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA YES NO X
QUALITY LEVEL I II X
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

CHECKER:

J. J. Ichkhan 1/26/93
J. J. Ichkhan, Mechanical Engineer Date

D. A. Buzzelli 1-26-93
D. A. Buzzelli, Lead Disc. Checker Date

APPROVED BY:

R. B. Erickson
C. J. Divona Lead Discipline Engineer

1-26-93
Date

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SECTION 15139
AIR DRIVEN DIAPHRAGM PUMPS
B-595-P-P33B-15139

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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>
A	DATA SHEETS
B	EQUIPMENT MAXIMUM ENVELOPE AND MODEL NUMBER OR EQUAL

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**SECTION 15139
AIR DRIVEN DIAPHRAGM PUMPS**

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the technical requirements for the design, fabrication, inspection and testing of air-driven diaphragm pumps. These pumps will be used in glass frit slurry service.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TEST AND MATERIALS (ASTM)

ASTM A217/A217M 1988 Standard Specification for Steel Castings, Martensitic Stainless and Alloy for Pressure-Containing Parts, Suitable for High Temperature Service

**AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
Boiler and Pressure Vessel Code**

ASME Section VIII, 1989 Rules for Construction of Pressure
Division 1 Vessels

HYDRAULIC INSTITUTE (HI)

HI 1983 Standards for Centrifugal, Rotary and Reciprocating Pumps, 14th Edition

INSTRUMENT SOCIETY OF AMERICA (ISA)

ISA S20 1981 Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC SP-6 1989 Surface Preparation Specification No. 6, Commercial Blast Cleaning

1.3 RELATED REQUIREMENTS

Specification Section 01730 Operation and Maintenance Data

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Specification Section 15196 Identification and Tagging Methods
for Mechanical Equipment

1.4 DEFINITIONS

CMTR - Certified Material Test Report

FAT - Factory Acceptance Test

Flow Repeatability - Describes the reproducibility of pump flow rate under a given set of conditions when capacity setting is varied and then returned to the set point being tested. Expressed as a percent of rated capacity.

Turndown Ratio - The ratio of rated capacity to minimum capacity that can be obtained while maintaining a specified repetitive accuracy.

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

- 1.6.1 Certified Material Test Reports (CMTRs) for the air driven diaphragm pumps. These CMTRs shall be in accordance with the requirements both of this specification section and Data Sheets P33B-DS-1, DS-2, DS-3 and DS-4 (Attachment A).
- 1.6.2 Outline drawing shall be submitted for Buyer approval. This drawing shall indicate dimensions, weights, anchor bolts and base plate details.
- 1.6.3 A list of recommended spare parts for one (1) year's routine operation shall be supplied. The spare parts list shall include sufficient data to permit procurement either from original manufacturer or any subsupplier.
- 1.6.4 Operation and maintenance manuals shall be provided in accordance with Specification Section 01730. Complete installation manuals shall also be submitted.
- 1.6.5 Factory Acceptance Test (FAT) reports shall be submitted for Buyer approval in accordance with Paragraph 2.4.

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1.6.6 Design Calculations

A mechanical design analysis shall be supplied. This analysis shall include supporting calculations used to establish operating characteristics in accordance with Data Sheets P33B-DS-1, DS-2, DS-3 and DS-4 (Attachment A). These calculations shall be complete and in sufficient detail to permit second-party review.

1.6.7 Data Sheets

- A. Seller shall submit complete data sheets for the furnished equipment. These data sheets shall reflect the design parameters in Data Sheets P33B-DS-1, DS-2, DS-3 and DS-4 (Attachment A).
- B. Seller shall submit complete instrumentation data sheets. ISA S20 specification forms for process measurement and control instruments, primary elements and control valves shall be submitted.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

- A. Site Elevation 714 feet above sea level
- B. Barometric Pressure 14.3 psia
- C. Outside Design Temperature
- 1) Maximum Design Temperature 110°F
- 2) Minimum Design Temperature -20°F
- 3) Wet Bulb Design Temperature 68°F

1.8.2 Operating Environment

- A. Normal Temperature 60° to 104°F
- B. Maximum Temperature 104°F
- C. Relative Humidity Not controlled

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PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Description

2.1.1.1 Work covered by this specification section includes (but is not limited to) design, materials, fabrication, test and delivery of:

- A. Pneumatically-actuated diaphragm slurry pumps.
- B. Baseplates.
- C. Pulsation dampeners.
- D. Exhaust mufflers.
- E. Integral air distribution valves.
- F. A combination filter, lubricator and regulator.

2.1.1.2 This specification section does not cover:

- A. Unloading and storage at jobsite.
- B. Foundation and anchor bolts.
- C. Installation labor.
- D. Piping, valves and fittings external to the equipment that are not specifically identified in this specification section.

2.1.2 The equipment listed in Paragraph 2.1.1.1 shall be suitable for the conditions of service stated in Data Sheets P33B-DS-1, DS-2, DS-3 and DS-4 (Attachment A). This equipment shall be designed and constructed (except for expendable materials such as gaskets, diaphragms and check valves) for a service life of not less than 20 years.

2.1.3 The equipment listed in Paragraph 2.1.1.1 shall be designed to facilitate rapid, economical maintenance. Gaskets, diaphragms and valves shall be easily serviceable. Major parts shall be designed and fabricated to ensure accurate alignment when reassembled.

2.1.4 The controlled-volume air driven diaphragm pump shall be designed to allow access for adjustment and/or replacement of the following:

- A. Air distribution valve.

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- B. Air distribution valve seals and gaskets.
- C. Check valves.
- D. Check valve seats.
- E. Diaphragm.

- 2.1.5 The controlled-volume air driven diaphragm pump furnished in accordance both with this specification section and HI requirements shall be capable of continuous operation throughout the range of the pump's capacity. The pump shall be of the diaphragm type, automatically controlled by an outside electrical signal. The diaphragm shall be actuated by a mechanically-coupled push rod. The diaphragm isolates the push rod from the process fluid. A built-in relief valve shall be included to relieve the pump's full capacity. This relief valve shall be set at 20 percent above the maximum operating discharge pressure. Guided, controlled-travel, double-ball check valves shall be included on both suction and discharge. Valves shall have renewable seats of either the screwed-in or shouldered type. Oil lubrication shall be performed either by splash or force-feed system. System shall incorporate self-actuated pressure regulator with an adjustable set point and capacity based on 10 percent offset or drop factor. The pump shall be provided with a manual local stroke adjustment. This is in addition to the remote volume adjuster.
- 2.1.6 The air driven diaphragm pump shall be furnished with an automatic volume control. The volume/capacity control shall be continuously variable from no flow to maximum capacity condition. Repetitive accuracy of all the volume adjustments shall be not less than 98 percent between the range of 10 to 100 percent of the specified pump capacity.
- 2.1.7 The pump flow rate shall be adjustable over the specified turndown ratio while pump is running.
- 2.1.8 Rated capacity shall be not less than 110 percent of the maximum capacity specified in Data Sheets DS-1, DS-2, DS-3 and DS-4 (Attachment A).
- 2.1.9 Flow repeatability shall be within $\pm 3\%$ over the specified turndown ratio.
- 2.1.10 Diaphragm material shall be compatible with the fluid it contacts at temperatures specified in accordance with Data Sheets DS-1, DS-2, DS-3 and DS-4 (Attachment A). This material shall be of sufficient thickness and density to prevent permeation.

Diaphragm shall be Viton or equal material for the service required.

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- 2.1.11 The air driven diaphragm pump shall be equipped with pulsation dampeners. These pulsation dampeners shall be of the diaphragm type. They shall be equipped with the means for recharging with air.
- A. The pulsation dampener diaphragms shall be designed to withstand a differential pressure not less than 10 percent greater than the maximum discharge pressure of the pump for which they are supplied.
- B. Materials used for pulsation dampeners shall be as corrosion and erosion resistant as the pump for which they are supplied.

- 2.1.12 The air driven diaphragm pump shall be equipped with an air exhaust muffler. This muffler shall be sized to limit equipment noise at the rated flow and pressure specified on Data Sheets DS-1, DS-2, DS-3 and DS-4 (Attachment A). Noise level shall not exceed 85 dB at 3 feet peripheral around the pump.

2.2 FABRICATION AND MANUFACTURE

- 2.2.1 Material for the air driven diaphragm pump casing shall be stainless steel in accordance with ASTM A217/A217M. Castings shall be sound. No shrink, blow holes, scale, blister and other defects shall be permitted. Surfaces shall be cleaned by manufacturer's standard methods. All casting burrs shall be filed or ground flush with the casting surface. The use of plastic or cement compounds to repair leaks and defects in pressure casings shall not be permitted.

Design stress, temperature restrictions and physical properties for the pump material shall be in accordance with the limitations for similar materials in ASME Section VIII, Division 1. Pressure-containing parts shall be built in accordance with ASME Section VIII, Division 1. Code stamp and data report forms are not required.

- 2.2.2 The baseplate shall be equipped with four (4) holes and shall be 316L S.S. These holes shall be 1/2 inch in diameter. They shall be used to accommodate four (4) 5/16-inch bolts. The bolts shall be of 316L S.S.
- 2.2.3 Inlet and outlet connections shall be in accordance with Data Sheets P33B-DS-1, DS-2, DS-3 and DS-4 (Attachment A).
- 2.2.4 The maximum available envelope for the air driven diaphragm pumps and the model numbers or equal are shown in Attachment B.

2.3 COATINGS

Each piece of equipment shall be thoroughly cleaned of all foreign material, including rust, after all fabrication procedures are completed. Cleaning shall be in accordance with SSPC SP-6. Manufacturer's standard prime and finish paint or coatings shall be applied. Stainless steel, nickel, brass, copper, monel, aluminum, hastelloy, lead, galvanized steel, plastics, elastomers and glass surfaces shall not be painted unless specified otherwise.

2.4 TESTING

2.4.1 Factory Acceptance Tests (FATs)

Factory acceptance tests (FATs) shall be performed in accordance with HI requirements. Buyer shall be notified in advance of all testing. Buyer reserves the right to witness all tests (FATs).

2.4.2 Test procedures for hydrostatic testing, production testing and calibration testing with inspection shall be in accordance with HI test standards. These procedures shall be submitted for Buyer approval.

2.4.3 FAT reports shall be submitted for Buyer approval.

2.5 LABELING

Labeling shall be in accordance with Specification Section 15196, Paragraph 2.2.2, Type 6. Such labeling shall be in addition to the manufacturer's identification plate.

2.6 PACKAGING

2.6.1 Preparation for shipment and packing shall be in accordance with Seller's standards. At minimum, packaging shall provide protection against corrosion and damage during normal handling, shipping and storage. Minimum preparation shall include the requirements listed below.

2.6.2 Machined surfaces, threads, bearings and bearing housings shall be protected during shipment by application of grease or other suitable rust-inhibiting compound.

2.6.3 Flanged openings shall be covered with wood or plastic protectors. Protectors shall be installed with a minimum of four (4) full diameter bolts and nuts of compatible material with the flange.

2.6.4 Threaded connections and tapped holes shall be capped or plugged to prevent thread damage. Compatible materials shall be used.

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- 2.6.5 Pump Unit Assemblies shall be shipped fully assembled on baseplate.
- 2.6.6 Controller shall be shipped separately. It shall be field wired to the pump assembly from the remote location.
- 2.6.7 Bracing, supports and rigging connections shall be provided to prevent damage during shipment, loading and unloading.
- 2.6.8 Separate or loose parts shall be completely boxed and attached to the main item to be shipped as a unit.

PART 3 EXECUTION

(Not Used)

END OF SECTION

9413202.0662

ATTACHMENT A

FLUOR DANIEL DATA SHEET U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 AIR DRIVEN DIAPHRAGM PUMPS	NO.	BY	REVISION	SHEET NO.	REV.
	▲	DATE		P33B-DS-1	0
	▲			DATE	CONTRACT
	▲			06-29-88	845734
	▲			TAG NO.	PX-580-003
	▲			SPECIFICATION SECT NO.	15139
				FOR CLIENT USE	
				ORIG BY	CHK'D
				M. Feldon	RMM
				APPR'D	

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: P33B - 15139							
SERVICE <u>PROCESS FRIT SLURRY</u> <u>FEED PUMP</u> PUMP MFR. _____ SIZE & TYPE _____ NO. STAGES _____ SERIAL NO. _____	AIR DRIVEN <u>1</u> PUMP TAG NO. <u>PX-580-003</u> <u>PROCESS FRIT SLURRY</u> <u>FEED PUMP</u> MOTOR TAG NO. <u>N/A</u> MOTOR PROVIDED BY <u>N/A</u>	PUMP MATERIALS CASING <u>316L S.S.</u> IMPELLER _____ INTERNAL PARTS <u>316L S.S.</u> NO. PUMPS REQ <u>1</u> NO. TURBINE DRIVEN _____					
LIQUID NAME: <u>80% GLASS FRIT IN</u> <u>1.5% FORMIC ACID</u> PUMPING TEMPERATURE (°F): NORMAL <u>77</u> MAX. <u>104</u> MIN. _____ SPECIFIC GRAVITY: @ <u>77</u> °F = <u>1.55</u> VAPOR PRESS. (PSIA): <u>0.5</u> VISCOSITY (CP): @ <u>77</u> °F = <u>11</u> CORROSION/EROSION CAUSED BY: _____ <u>FORMIC ACID/GLASS FRIT</u> REMARKS: _____	OPERATING CONDITIONS CAPACITY (U.S. GPM): NORMAL <u>70</u> RATED _____ DISCHARGE PRESSURE (PSIG): <u>28.7</u> SUCTION PRESSURE (PSIG): MAX. <u>0</u> RATED <u>-5</u> DIFFERENTIAL PRESSURE (PSI): <u>35</u> DIFFERENTIAL HEAD (FEET): <u>54</u> NPSH AVAILABLE (FEET): <u>10</u> HYDRAULIC POWER (HP): <u>1.5</u>	SITE CONDITIONS TEMP. (°F): MAX. <u>104</u> MIN. <u>80</u> REL. HUMID. (%): MAX. _____ MIN. _____ ALTITUDE (FEET): _____ <input checked="" type="radio"/> INDOOR <input checked="" type="radio"/> HEATED <input type="radio"/> ROOF <input type="radio"/> INDOOR <input type="radio"/> HEATED <input type="radio"/> ROOF AREA CLASSIFICATION: <u>3</u> OTHER: _____ REMARKS: <u>PLANT AIR AVAILABLE AT</u> <u>100 PSIG</u>					
PERFORMANCE (TO BE COMPLETED BY MANUFACTURER)							
PROPOSAL CURVE NO.: _____ SPEED (RPM): _____ EFFICIENCY (%): _____ RATED POWER (BHP): _____	MINIMUM CONTINUOUS FLOW (GPM): THERMAL _____ STABLE _____ MAX. HEAD RATED IMP. (FEET): _____ MAX. POWER RATED IMP. (BHP): _____	NPSH REQUIRED (FEET WATER): <u>3% HEAD DROP</u> SUCTION SPECIFIED SPEED: _____					
CONSTRUCTION (TO BE COMPLETED BY PURCHASER AND MANUFACTURER)							
NOZZLES	FLUID	RATING	AIR	FACING	MISC. CONNECTIONS	SIZE	TYPE
SUCTION	2"	NPT (F)	1/2"	NPT (F)	DRAIN	1"	NPT (F)
DISCHARGE	2"	NPT (F)	3/4"	NPT (F)	VENT	1/2"	NPT (F)
CASING MOUNT: <input type="checkbox"/> FOOT <input type="checkbox"/> BRACKET CENTERLINE <input type="checkbox"/> NEAR CNTRL <input type="checkbox"/> INLINE CASING SPLT: <input type="checkbox"/> AXIAL <input type="checkbox"/> RADIAL CASING TYPE: <input type="checkbox"/> DIFFUSER <input type="checkbox"/> STAGGERED <input type="checkbox"/> SINGLE VOLUTE <input type="checkbox"/> DOUBLE VOLUTE MAX. ALLOWABLE PRESSURE (PSIG): AT 60°F <u>100</u> AT NOM. PUMP TEMP. _____ HYDRO TEST PRESSURE (PSIG): <u>150</u> LUBRICATION TYPE: <input type="checkbox"/> API 614 <input type="checkbox"/> GREASE <input type="checkbox"/> RING OIL <input type="checkbox"/> OIL MIST <input type="checkbox"/> FLOOD <input type="checkbox"/> FLINGER <input type="checkbox"/> PRESSURE REMARKS: _____				IMPELLER DIAMETER (INCHES) RATE _____ MAX. _____ MIN. _____ IMPELLER TYPE: <input type="checkbox"/> OPEN <input type="checkbox"/> CLOSED IMP. SUCTION: <input type="checkbox"/> SINGLE <input type="checkbox"/> DOUBLE IMP. MOUNT: <input type="checkbox"/> BTWN. BRGS <input type="checkbox"/> OVERHUNG ROTATION (COUPLING END): <input type="checkbox"/> CW <input type="checkbox"/> CCW BEARING (TYPE/NUMBER): RADIAL _____ <u>N/A</u> TRUST _____ COUPLING: MANUFACTURER <u>N/A</u> TYPE/MODEL _____ DRIVER HALF-COUPLING MOUNTED BY: <input type="radio"/> PUMP MFR. <input type="radio"/> DRIVER MFR. <input type="radio"/> DRIVER MFR. <input type="radio"/> BY PURCHASER <input checked="" type="checkbox"/> BY MFR./PURCHASER			
				PRESSURE GAGE _____ WARM UP _____ BALANCE _____ PACKING: MANUFACTURER _____ TYPE _____ SIZE/NO. RINGS _____ MECHANICAL SEAL: API CLASS CODE _____ MANUFACTURER _____ MODEL _____ MFR. CODE _____ <input type="radio"/> CARTRIDGE TYPE REQUIRED GLAND TYPE/MAT'L _____ GLAND PLATE TAPS REQUIRED FOR: <input type="radio"/> QUENCH <input type="radio"/> FLUSH <input type="radio"/> DRAIN <input type="radio"/> VENT			

ATTACHMENT A

FLUOR DANIEL



DATA SHEET

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

AIR DRIVEN DIAPHRAGM PUMPS

NO. ▲ ▲ ▲ ▲ ▲ ▲	BY DATE	REVISION	SHEET NO. P33B-DS-2	REV 0
			DATE 08-28-88	CONTRACT 845734
			TAG NO. PX-580-004	
			SPECIFICATION SECT NO. 15139	
			FOR CLIENT USE	
			ORIG BY M. Feldon	CHK'D RMM

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: P33B - 15139

SERVICE SAMPLE PUMP (PROCESS) FRT SLURRY FEED TANK	AIR DRIVEN 1	PUMP TAG NO. PX-580-004	PUMP MATERIALS CASING 316L S.S. IMPELLER 316L S.S. INTERNAL PARTS 316L S.S.
PUMP MFR. SAMPLE PUMP (PROCESS FRT)			
SIZE & TYPE SLURRY FEED TANK			
NO. STAGES	MOTOR TAG NO. N/A	NO. PUMPS REQ 1	
SERIAL NO.	MOTOR PROVIDED BY N/A	NO. TURBINE DRIVEN	

LIQUID	OPERATING CONDITIONS	SITE CONDITIONS
NAME: 60% GLASS FRT IN 1.5% FORMIC ACID	CAPACITY (U.S. GPM): NORMAL 7 RATED	TEMP (°F): MAX. 104 MIN. 80
PUMPING TEMPERATURE (°F): NORMAL 77 MAX. 104 MIN.	DISCHARGE PRESSURE (PSIG): 5	REL HUMID. (%): MAX. MIN.
SPECIFIC GRAVITY: @ 77 °F = 1.55	SUCTION PRESSURE (PSIG):	ALTITUDE (FEET):
VAPOR PRESS. (PSIA): 0.5	MAX. 0 RATED -6	① INDOOR ② HEATED ③ ROOF ④ INDOOR ⑤ HEATED ⑥ ROOF
VISCOSITY (CP): @ 77 °F = 11	DIFFERENTIAL PRESSURE (PSI): 20 (1)	AREA CLASSIFICATION: 3
CORROSION/EROSION CAUSED BY: FORMIC ACID/GLASS FRT	DIFFERENTIAL HEAD (FEET) 30	OTHER:
REMARKS:	NPSH AVAILABLE (FEET): 10	REMARKS: PLANT AIR AVAILABLE AT 100 PSIG
	HYDRAULIC POWER (HP): 0.082	

PERFORMANCE (TO BE COMPLETED BY MANUFACTURER)

PROPOSAL CURVE NO.:	MINIMUM CONTINUOUS FLOW (GPM): THERMAL STABLE	NPSH REQUIRED (FEET WATER): 3% HEAD DROP
SPEED (RPM):	MAX. HEAD RATED IMP. (FEET):	SUCTION SPECIFIED SPEED:
EFFICIENCY (%):	MAX. POWER RATED IMP. (BHP):	
RATED POWER (BHP):		

CONSTRUCTION (TO BE COMPLETED BY PURCHASER AND MANUFACTURER)

NOZZLES	FLUID		AIR		MISC. CONNECTIONS	SIZE	TYPE
	SIZE	RATING	SIZE	RATING			
SUCTION	1/2"	NPT (F)	1/2"	NPT (F)	DRAIN	1"	NPT (F)
DISCHARGE	1"	NPT (F)	3/4"	NPT (F)	VENT	1/2"	NPT (F)

CASING MOUNT: <input type="checkbox"/> FOOT <input type="checkbox"/> BRACKET CENTERLINE <input type="checkbox"/> NEAR CNTRL <input type="checkbox"/> INLINE CASING SPLIT: <input type="checkbox"/> AXIAL <input type="checkbox"/> RADIAL CASING TYPE: <input type="checkbox"/> DIFFUSER <input type="checkbox"/> STAGGERED <input type="checkbox"/> SINGLE VOLUTE <input type="checkbox"/> DOUBLE VOLUTE MAX. ALLOWABLE PRESSURE (PSIG): AT 80°F 100 AT NOM. PUMP TEMP HYDRO TEST PRESSURE (PSIG): 150 LUBRICATION TYPE: <input type="checkbox"/> API 614 <input type="checkbox"/> GREASE <input type="checkbox"/> RING OIL <input type="checkbox"/> OIL MIST <input type="checkbox"/> FLOOD <input type="checkbox"/> FLINGER <input type="checkbox"/> PRESSURE REMARKS:	IMPELLER DIAMETER (INCHES) RATE MAX. MIN. IMPELLER TYPE: <input type="checkbox"/> OPEN <input type="checkbox"/> CLOSED IMP. SUCTION: <input type="checkbox"/> SINGLE <input type="checkbox"/> DOUBLE IMP. MOUNT: <input type="checkbox"/> BTWN. BRGS <input type="checkbox"/> OVERHUNG ROTATION (COUPLING END): <input type="checkbox"/> CW <input type="checkbox"/> CCW BEARING (TYPE/NUMBER): RADIAL N/A TRUST COUPLING: MANUFACTURER N/A TYPE/MODEL DRIVER HALF-COUPLING MOUNTED BY: <input type="radio"/> PUMP MFR. <input type="radio"/> DRIVER MFR. <input type="radio"/> DRIVER MFR. <input type="radio"/> BY PURCHASER <input type="checkbox"/> BY MFR./PURCHASER	PRESSURE GAGE WARM UP BALANCE PACKING: MANUFACTURER TYPE SIZE/NO. RINGS MECHANICAL SEAL: API CLASS CODE MANUFACTURER MODEL MFR. CODE <input type="radio"/> CARTRIDGE TYPE REQUIRED GLAND TYPE/MAT'L GLAND PLATE TAPS REQUIRED FOR: <input type="radio"/> QUENCH <input type="radio"/> FLUSH <input type="radio"/> DRAIN <input type="radio"/> VENT
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ATTACHMENT A

FLUOR DANIEL DATA SHEET U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 AIR DRIVEN DIAPHRAGM PUMPS	NO.	BY DATE	REVISION	SHEET NO. P33B-DS-3	REV. 0
	▲			DATE 08-29-88	CONTRACT 845734
	▲			TAG NO.	PX-580-005
	▲			SPECIFICATION SECT NO 15139	
	▲			FOR CLIENT USE	
	▲			ORIG BY M. Feldon	CHK'D RMM

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: P33B - 15139		
SERVICE <u>DFSFT RECIRCULATION PUMP</u> PUMP MFR. _____ SIZE & TYPE _____ NO. STAGES _____ SERIAL NO. _____	AIR DRIVEN <u>1</u> PUMP TAG NO. <u>PX-580-005</u> <u>DFSFT RECIRCULATION PUMP</u> MOTOR TAG NO. <u>N/A</u> MOTOR PROVIDED BY <u>N/A</u>	PUMP MATERIALS CASING <u>316L S.S.</u> IMPELLER _____ INTERNAL PARTS <u>316L S.S.</u> NO. PUMPS REQ <u>1</u> NO. TURBINE DRIVEN _____

LIQUID NAME <u>8% GLASS FRIT IN WATER</u> <u>AND FORMIC ACID; pH-2</u> PUMPING TEMPERATURE (°F): NORMAL <u>77</u> MAX. <u>104</u> MIN. _____ SPECIFIC GRAVITY: @ <u>77</u> °F = <u>1.04</u> VAPOR PRESS. (PSIA): <u>0.5</u> VISCOSITY (CP): @ <u>77</u> °F = <u>1.1</u> CORROSION/EROSION CAUSED BY: _____ <u>FORMIC ACID/GLASS FRIT</u> REMARKS: <u>pH - 2</u>	OPERATING CONDITIONS CAPACITY (U.S. GPM): NORMAL <u>85</u> RATED _____ DISCHARGE PRESSURE (PSIG): <u>43.5</u> SUCTION PRESSURE (PSIG): _____ MAX. <u>0</u> RATED <u>-3</u> DIFFERENTIAL PRESSURE (PSI): <u>48.5</u> DIFFERENTIAL HEAD (FEET) <u>103</u> NPSH AVAILABLE (FEET): <u>22</u> HYDRAULIC POWER (HP): <u>2.3</u>	SITE CONDITIONS TEMP. (°F): MAX. _____ MIN. _____ REL. HUMID. (%): MAX. _____ MIN. _____ ALTITUDE (FEET): _____ <input checked="" type="radio"/> INDOOR <input checked="" type="radio"/> HEATED <input type="radio"/> ROOF <input type="radio"/> INDOOR <input type="radio"/> HEATED <input type="radio"/> ROOF AREA CLASSIFICATION: <u>3</u> OTHER: _____ REMARKS: <u>PLANT AIR AVAILABLE AT</u> <u>100 PSIG</u>
--	---	---

PERFORMANCE (TO BE COMPLETED BY MANUFACTURER)		
PROPOSAL CURVE NO.: _____ SPEED (RPM): _____ EFFICIENCY (%): _____ RATED POWER (BHP): _____	MINIMUM CONTINUOUS FLOW (GPM): THERMAL _____ STABLE _____ MAX. HEAD RATED IMP. (FEET): _____ MAX. POWER RATED IMP. (BHP): _____	NPSH REQUIRED (FEET WATER): <u>3% HEAD DROP</u> SUCTION SPECIFIED SPEED: _____

CONSTRUCTION (TO BE COMPLETED BY PURCHASER AND MANUFACTURER)							
NOZZLES	FLUID		AIR		MISC. CONNECTIONS	SIZE	TYPE
	SIZE	RATING	SIZE	RATING			
SUCTION	2"	NPT (F)	1 1/2"	NPT (F)	DRAIN	1"	NPT (F)
DISCHARGE	2"	NPT (F)	3/4"	NPT (F)	VENT	1 1/2"	NPT (F)

CASING MOUNT: <input type="checkbox"/> FOOT <input type="checkbox"/> BRACKET CENTERLINE: <input type="checkbox"/> NEAR CNTRL <input type="checkbox"/> INLINE CASING SPLIT: <input type="checkbox"/> AXIAL <input type="checkbox"/> RADIAL CASING TYPE: <input type="checkbox"/> DIFFUSER <input type="checkbox"/> STAGGERED <input type="checkbox"/> SINGLE VOLUTE <input type="checkbox"/> DOUBLE VOLUTE MAX. ALLOWABLE PRESSURE (PSIG): AT 80°F <u>100</u> AT NOM. PUMP TEMP. _____ HYDRO TEST PRESSURE (PSIG): <u>150</u> LUBRICATION TYPE: <input type="checkbox"/> API 614 <input type="checkbox"/> GREASE <input type="checkbox"/> RING OIL <input type="checkbox"/> OIL MIST <input type="checkbox"/> FLOOD <input type="checkbox"/> FLINGER <input type="checkbox"/> PRESSURE REMARKS: _____	IMPELLER DIAMETER (INCHES) RATE _____ MAX. _____ MIN. _____ IMPELLER TYPE: <input type="checkbox"/> OPEN <input type="checkbox"/> CLOSED IMP. SUCTION: <input type="checkbox"/> SINGLE <input type="checkbox"/> DOUBLE IMP. MOUNT: <input type="checkbox"/> BTWN. BRGS <input type="checkbox"/> OVERHUNG ROTATION (COUPLING END): <input type="checkbox"/> CW <input type="checkbox"/> CCW BEARING (TYPE/NUMBER): RADIAL <u>N/A</u> TRUST _____ COUPLING: MANUFACTURER <u>N/A</u> TYPE/MODEL _____ DRIVER HALF-COUPLING MOUNTED BY: <input type="radio"/> PUMP MFR. <input type="radio"/> DRIVER MFR. <input type="radio"/> DRIVER MFR. <input type="radio"/> BY PURCHASER <input type="checkbox"/> BY MFR./PURCHASER	PRESSURE GAGE _____ WARM UP _____ BALANCE _____ PACKING: MANUFACTURER _____ TYPE _____ SIZE/NO. RINGS _____ MECHANICAL SEAL: API CLASS CODE _____ MANUFACTURER _____ MODEL _____ MFR. CODE _____ <input type="radio"/> CARTRIDGE TYPE REQUIRED GLAND TYPE/MAT'L _____ GLAND PLATE TAPS REQUIRED FOR: <input type="radio"/> QUENCH <input type="radio"/> FLUSH <input type="radio"/> DRAIN <input type="radio"/> VENT
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ATTACHMENT A

FLUOR DANIEL



DATA SHEET

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

AIR DRIVEN DIAPHRAGM PUMPS

NO. △ △ △ △ △ △	BY DATE	REVISION	SHEET NO. P33B-DS-4	REV. 0
			DATE 08-29-88	CONTRACT 845734
			TAG NO. PX-580-006	
			SPECIFICATION SECT NO. 15139	
			FOR CLIENT USE	
			ORIG BY M. Feldon	CHK'D RMM

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: P33B - 15139

SERVICE SAMPLE PUMP (DECONTAMINATION FRIT SLURRY FEED TANK)	AIR DRIVEN 1	PUMP MATERIALS
PUMP MFR. SAMPLE PUMP (DECONTAMINATION FRIT SLURRY)	PUMP TAG NO. PX-580-006	CASING 316L S.S.
SIZE & TYPE FEED TANK	MOTOR TAG NO. SAME	IMPELLER
NO. STAGES	MOTOR PROVIDED BY MANUFACTURER	INTERNAL PARTS 316L S.S.
SERIAL NO.		NO. PUMPS REQ 1
		NO. TURBINE DRIVEN

LIQUID	OPERATING CONDITIONS	SITE CONDITIONS
NAME: 8% GLASS FRIT IN 1.5% FORMIC ACID	CAPACITY (U.S. GPM): NORMAL 3 RATED	TEMP. (°F): MAX. 104 MIN. 60
PUMPING TEMPERATURE (°F): NORMAL 77 MAX. 104 MIN.	DISCHARGE PRESSURE (PSIG): 2.5	REL HUMID. (%): MAX. MIN.
SPECIFIC GRAVITY: @ 77 °F = 1.045	SUCTION PRESSURE (PSIG): MAX. 0 RATED -4	ALTITUDE (FEET):
VAPOR PRESS. (PSIA): 0.5	DIFFERENTIAL PRESSURE (PSI): 20 (EST.)	<input checked="" type="radio"/> INDOOR <input checked="" type="radio"/> HEATED <input type="radio"/> ROOF
VISCOSITY (CP): @ 77 °F = 1.1	DIFFERENTIAL HEAD (FEET): 45	<input type="radio"/> INDOOR <input type="radio"/> HEATED <input type="radio"/> ROOF
CORROSION/EROSION CAUSED BY: FORMIC ACID/GLASS FRIT	NPSH AVAILABLE (FEET): 20	AREA CLASSIFICATION: 3
REMARKS:	HYDRAULIC POWER (HP): 0.04	OTHER:
		REMARKS: PLANT AIR AVAILABLE AT 100 PSIG

PERFORMANCE (TO BE COMPLETED BY MANUFACTURER)

PROPOSAL CURVE NO.:	MINIMUM CONTINUOUS FLOW (GPM): THERMAL STABLE	NPSH REQUIRED (FEET WATER): 3% HEAD DROP
SPEED (RPM):	MAX. HEAD RATED IMP. (FEET):	SUCTION SPECIFIED SPEED:
EFFICIENCY (%):	MAX. POWER RATED IMP. (BHP):	
RATED POWER (BHP):		

CONSTRUCTION (TO BE COMPLETED BY PURCHASER AND MANUFACTURER)

NOZZLES	FLUID		AIR		MISC. CONNECTIONS	SIZE	TYPE
	SIZE	RATING	SIZE	RATING			
SUCTION	1/2"	NPT (F)	1/2"	NPT (F)	DRAIN	1"	NPT (F)
DISCHARGE	1"	NPT (F)	3/4"	NPT (F)	VENT	1/2"	NPT (F)

CASING MOUNT: <input type="checkbox"/> FOOT <input type="checkbox"/> BRACKET	IMPELLER DIAMETER (INCHES) RATE MAX. MIN.	PRESSURE GAGE
CENTERLINE: <input type="checkbox"/> NEAR CNTRL. <input type="checkbox"/> INLINE	IMPELLER TYPE: <input type="checkbox"/> OPEN <input type="checkbox"/> CLOSED	WARM UP
CASING SPLIT: <input type="checkbox"/> AXIAL <input type="checkbox"/> RADIAL	IMP. SUCTION: <input type="checkbox"/> SINGLE <input type="checkbox"/> DOUBLE	BALANCE
CASING TYPE: <input type="checkbox"/> DIFFUSER <input type="checkbox"/> STAGGERED	IMP. MOUNT: <input type="checkbox"/> BTWN. BRGS <input type="checkbox"/> OVERHUNG	PACKING:
<input type="checkbox"/> SINGLE VOLUTE <input type="checkbox"/> DOUBLE VOLUTE	ROTATION (COUPLING END): <input type="checkbox"/> CW <input type="checkbox"/> CCW	MANUFACTURER
MAX. ALLOWABLE PRESSURE (PSIG): AT 60°F 100	BEARING (TYPE/NUMBER): RADIAL N/A	TYPE
AT NOM. PUMP TEMP.	TRUST	SIZE/NO. RINGS
HYDRO TEST PRESSURE (PSIG): 150	COUPLING:	MECHANICAL SEAL:
LUBRICATION TYPE: <input type="checkbox"/> API 814	MANUFACTURER N/A	API CLASS CODE
<input type="checkbox"/> GREASE <input type="checkbox"/> RING OIL <input type="checkbox"/> OIL MIST	TYPE/MODEL	MANUFACTURER
<input type="checkbox"/> FLOOD <input type="checkbox"/> FLINGER <input type="checkbox"/> PRESSURE	DRIVER HALF-COUPLING MOUNTED BY:	MODEL
REMARKS:	<input type="radio"/> PUMP MFR. <input type="radio"/> DRIVER MFR. <input type="radio"/> DRIVER MFR.	MFR. CODE
	<input type="radio"/> BY PURCHASER <input type="checkbox"/> BY MFR./PURCHASER	<input type="radio"/> CARTRIDGE TYPE REQUIRED
		GLAND TYPE/MAT'L
		GLAND PLATE TAPS REQUIRED FOR:
		<input type="radio"/> QUENCH <input type="radio"/> FLUSH <input type="radio"/> DRAIN <input type="radio"/> VENT

Rev. 0

ATTACHMENT B
EQUIPMENT MAXIMUM ENVELOPE
AND MODEL NUMBER OR EQUAL

TAG NUMBER	MODEL NUMBER*	MAXIMUM ENVELOPE (inches)		
		LENGTH	WIDTH	HEIGHT
PX-580-003	Warren Rupp Sandpiper EB2-A Type TN-2-SS	13	19	23
PX-580-004	Warren Rupp Sandpiper EB1/2-A Type TN-2-SS	9.5	7	11
PX-580-005	Warren Rupp Sandpiper EB2-A Type TN-2-SS	13	19	23
PX-580-006	Warren Rupp Sandpiper EB1/2-A Type TN-2-SS	9.5	7	11

9413202.0667

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 15141
CENTRIFUGAL PUMPS
B-595-P-P33B-15141

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA YES NO X
QUALITY LEVEL I II X
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

J. J. Ichkhan
J. J. Ichkhan, Mechanical Eng. 1-26-93
Date

CHECKER:

D. A. Buzzelli
D. A. Buzzelli, Lead Disc. Checker 1-26-93
Date

APPROVED BY:

R. B. Erickson
C. J. Divona Lead Discipline Engineer

1-26-93
Date

SECTION 15141
CENTRIFUGAL PUMPS
B-595-P-P33B-15141

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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>
A	DATA SHEETS
B	EQUIPMENT MAXIMUM ENVELOPE AND MODEL NUMBER OR EQUAL

9473202.0669

**SECTION 15141
CENTRIFUGAL PUMPS**

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the technical requirements for the design, fabrication, inspection and testing of centrifugal pumps.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B16.5 1988 Pipe Flanges and Flanged Fittings

AMERICAN PETROLEUM INSTITUTE (API)

API 610 1989 Centrifugal Pumps for General
Refinery Services, 7th Edition

**AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
Boiler and Pressure Vessel Code**

ASME Section VIII, 1989 Rules for Construction of Pressure
Division 1 Vessels

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 1990 Structural Welding Code Steel, 12th
Edition

ANTIFRICTION BEARING MANUFACTURERS ASSOCIATION (AFBMA)

AFBMA 9 1990 Edition - Load Ratings and Fatigue
Life for Ball Bearings

AFBMA 11 1990 Edition - Load Ratings and Fatigue
Life for Roller Bearings

HYDRAULIC INSTITUTE (HI)

HI 1983 Standards for Centrifugal, Rotary and
Reciprocating Pumps, 14th Edition

0260-2026-16
943202-0670

Rev. 0

INSTRUMENT SOCIETY OF AMERICA (ISA)

ISA S20 1981 Specification Forms for Process
Measurement and Control Instruments,
Primary Elements and Control Valves

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

OSHA Standard 1978 Guards for Rotating Equipment
Instruction 1-12.14

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC SP-6 1989 Surface Preparation Specification
No. 6, Commercial Blast Cleaning

1.3 RELATED REQUIREMENTS

Specification Section 01730 Operation and Maintenance Data
Specification Section 15196 Identification and Tagging Methods
for Mechanical Equipment
Specification Section 16150 Motors - Induction for General
Service

1.4 DEFINITIONS

FAT - Factory Acceptance Test
NPSH - Net Positive Suction Head
TEFC - Totally Enclosed Fan Cooled

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and
Data Requirements section of the Order/Subcontract.

1.6.1 Drawings

- 1.6.1.1 A. Certified dimensional outline drawings shall be submitted
for Buyer approval. These drawings shall include
dimensions, shipping weights, operating weights and
clearances to be maintained. They shall also show design
temperatures and pressures, operating temperatures and
pressures, size and location of all connections, lifting

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supports, materials of construction and corrosion allowances. Drawings which include the base frame shall include base plate thickness at the foundation bolts, location of anchor bolts and size of control panel fasteners.

- B. Sectional drawings shall be submitted for Buyer approval. These drawings shall show inside arrangement construction and details for each component.
- C. The allowable loads on both the pump discharge nozzles and suction nozzles shall be furnished for Buyer approval.

All drawings shall include a detailed bill of materials. This bill shall list the manufacturer, type and ratings of all component parts or assemblies.

- 1.6.1.2 Ratings in HP for the fully-installed pump drive motor shall be supplied.
- 1.6.2 Technical Data
 - 1.6.2.1 Design Calculations - Engineering design analysis with supporting calculations used to establish connected horsepower requirements, shaft sizes, bearing loads and operating characteristics. Calculations shall be complete and in sufficient detail to permit a second party review.
 - 1.6.2.2 Descriptive Literature - Descriptive literature including equipment ratings, model numbers, operating characteristics and technical descriptions.
 - 1.6.2.3 Data Sheets
 - A. Completed data sheets as indicated in P33B-DS-1 and DS-2 (Attachment A).
 - B. Complete ISA S20 specification forms for process measurement and control instruments, primary elements and control valves.
 - 1.6.2.4 Pump Performance Curves - Pump performance curves shall be provided. Curves shall include pump brake horsepower, efficiency, Net Positive Suction Head (NPSH) required, viscosity and specific gravity corrections.
 - 1.6.2.5 Nozzle loadings in accordance with Paragraph 2.4 and Table 2 of API 610.
 - 1.6.2.6 Factory Acceptance Tests (FATs) as defined in Paragraph 2.4.2.

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1.6.3 Spare Parts List

A list of recommended spare parts for one (1) year's routine operation shall be supplied. The spare parts list shall include sufficient data to permit procurement from the original manufacturer or any subsupplier.

1.6.4 Installation, Operation and Maintenance Manuals

Seller shall provide operation and maintenance manuals. These shall cover the centrifugal pumps furnished in accordance with this specification section. The manuals shall fully detail sequences of disassembly, repair, adjustment, reassembly, lubrication and troubleshooting. Troubleshooting sections shall include fault trees to guide both mechanical and electrical diagnostics. Reduced-size copies of any assembly drawing, sub-assembly drawing and parts list needed for routine maintenance and overhaul shall be included. This data shall be submitted in accordance with Specification Section 01730. Complete installation manuals shall also be submitted.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

- | | | |
|----|-----------------------------|--------------------------|
| A. | Site Elevation | 714 feet above sea level |
| B. | Barometric Pressure | 14.3 psia |
| C. | Outside Design Temperature | |
| 1) | Maximum Design Temperature | 110°F |
| 2) | Minimum Design Temperature | -20°F |
| 3) | Wet Bulb Design Temperature | 68°F |
| D. | Operating Environment | |
| 1) | Normal Temperature | 60°F to 104°F |
| 2) | Maximum Temperature | 104°F |
| 3) | Relative Humidity | Not controlled |

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PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 General Requirements

Centrifugal pumps shall be furnished by a manufacturer normally engaged in the production of industrial centrifugal pumps. Pumps furnished in accordance with this specification section shall be centrifugal pumps designed and constructed in accordance with the requirements of both API 610 and the HI standard for the intended service.

All exposed moving parts shall have heavy-duty, removable guards provided in accordance with OSHA Standard Instruction 1-12.14.

Seller shall be responsible for the design, selection and performance of the pumps.

2.1.2 Baseplates and Supports

A fabricated steel drive baseplate shall be furnished. This baseplate shall be designed such that all equipment and auxiliary piping are located within its confines. It shall be rigid enough to maintain pump machinery alignment during shipping. The baseplate for the pump furnished shall be in accordance with API 610, Paragraph 3.3. It shall be Type 304L stainless steel.

Lifting lugs or other arrangements shall be provided for hoisting and handling the assembled unit during field erection.

- A. Pump and motor support pads shall be machined flat and in the same plane within 0.002 inch per foot between pads.
- B. Motor support pads shall be machined to provide a minimum of 3/16 inch shim height.
- C. That portion of the drive base under the pump shall have a drain pan with raised lip construction. The drain pan shall have a threaded connection at the pump outboard end.
- D. Shaft centerlines shall be of sufficient height above the baseplate to permit the piping of all auxiliary connections.
- E. No component of the unit except the motor conduit box shall overhang the drained baseplate.
- F. Baseplate shall be in accordance with API 610 Baseplate Numbers 0.5-12. The holes shall be 3/16 inch larger than the required bolt size.

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- G. Anchor bolt size shall be not less than 3/4 inch diameter.
- H. Pipe supports shall provide piping flexibility and accessibility necessary for proper operation and maintenance.
- I. Flanges shall be in accordance with ANSI B16.5.

2.1.3 Maximum envelope sizes and model numbers of equipment or equal are illustrated in Attachment B.

2.2 FABRICATION AND MANUFACTURE

2.2.1 General Requirements

The pump operating point shall be within 10 percent of the peak efficiency on the pump performance curve. At design conditions and at maximum horsepower along the pump curve, the horsepower requirements shall not exceed the nominal rating of the motor as shown on the nameplate (excluding service factor).

All rotating parts of the assembled equipment shall operate throughout the required range without excessive vibration, or noise. The noise level shall not exceed 85 dB at 3 feet peripheral around the pump skid.

2.2.2 Pump Casing

Pump casings shall be designed for the maximum discharge pressure at pumping temperature and hydrostatic test pressure at ambient temperature. Materials, casting factors and the quality of any welding shall be in accordance with ASME Section VIII, Division 1. The pump must come with a casing vent. Code stamp and data report forms are not required.

2.2.3 Materials

Pump casing material shall be in accordance with API 610, Class A-7, Table H-1. The material shall be identified in accordance with this standard. Bearings, shafts and grease-lubricated seals shall be manufacturer's standard for the intended service.

Castings shall be sound. No shrink, blow holes, scale, blisters or other defects shall be permitted. Surfaces shall be cleaned by manufacturer's standard methods. All casting burrs shall be filed or ground flush with the casting surface. The use of plastic or cement compounds to repair leaks and defects in pressure casings shall not be permitted.

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2.2.4 Bearings

Bearings shall be sized to take the thrust loads of 150 percent of rated capacity at maximum speed. The life for antifriction bearings specified therein shall be L-10 of 100,000 hours service life calculated in accordance both with AFBMA 9 and AFBMA 11.

2.2.5 Vibration

Major rotating components such as impellers and balancing drums shall be dynamically balanced in accordance with API 610, Paragraph 2.8.4. Peak-to-peak vibration limits shall apply to all pumps. These limits shall cover rotor vibration during shop and field tests at rated speed and throughout the full operating capacity. Peak-to-peak limits measured on the shaft are:

Speed (rpm)	Anti-Friction Bearings ⁽¹⁾
1800 and below	1.5 mils

(1) Measured on bearing housing

2.2.6 Coupling

Pump manufacturer shall mount pump and motor half couplings. Couplings shall be rated for a minimum of 150 percent of motor nameplate horsepower at design rpm. All metal flexible coupling shall be keyed to both shafts. Couplings and guards shall be in accordance with API 610, Paragraph 3.2. The coupling material shall be compatible with the material of the equipment shaft.

2.2.7 Safety Guarding

All safety guards, color coding, signs, accessibility, etc., shall be in accordance with OSHA Standard Instruction 1-12.14. Safety guards shall be designed such that the guarded equipment is easily accessible for maintenance.

2.2.8 Electrical Requirements

Motors shall be integral, foot-mounted, totally enclosed fan cooled (TEFC), squirrel-cage, induction type. They shall have normal starting and breakdown torque. Motors shall be in accordance with Specification Section 16150 except as modified herein.

2.2.9 Coatings

After completion of all fabrication procedures the external surfaces of each pump shall be thoroughly cleaned of all foreign materials, including rust, in accordance with SSPC SP-6.

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Manufacturer's standard prime and finish paint or coatings shall be applied. Stainless steel, nickel, brass, copper, monel, aluminum, hastelloy, lead, galvanized steel, plastics, elastomers and glass surfaces shall not be painted unless specified otherwise.

2.2.10 Welding

All pump unit assembly welding requirements shall be in accordance with API 610 Paragraph 2.11.3 standard practice.

Baseplate and support welding requirements shall be in accordance with AWS D1.1.

2.3 LABELING

Labeling and tagging shall be in accordance with Specification Section 15196, Paragraph 2.2.2, Type 6. This shall be in addition to the manufacturer's identification plate.

2.4 INSPECTION AND TESTING

2.4.1 Inspection and testing shall be in accordance with API 610 Paragraphs 4.1, 4.2 and 4.3.

2.4.2 Factory Acceptance Tests (FATs)

- A. Seller shall shop-test the unit to verify pump performance. A detailed shop testing procedure shall be submitted for Buyer approval prior to testing. Buyer shall be notified in advance of all source testing and shall be allowed to witness all tests (FATs).
- B. Pump shall be tested at the factory to provide detailed performance data and demonstrate conformance to specifications. The pump shall be hydrostatically tested for a period of time not less than 30 minutes. The test pressure shall be not less than one and one-half times the head capabilities of the maximum diameter impeller for the casing at shutoff, plus the pump maximum allowable suction head. In no case shall the test pressure be less than 250 psig. Pump casing shall be tight at the test pressure. During the test, no visible leakage shall occur at any joint.
- C. Seller shall furnish certified shop test curves and FAT reports. They shall show head-capacity, efficiency and brake horsepower of the pump in accordance with API 610 Paragraph 5.2.4.

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2.5 **PACKAGING**

Packaging and preparation for shipment shall be in accordance with Seller's standards. At minimum, protection shall be provided against corrosion and damage during normal handling, shipping and storage. Minimum preparation shall include the requirements listed below.

- 2.5.1 Machined surfaces, threads, bearings and bearing housings shall be protected during shipment by application of grease or other suitable rust-inhibiting compound.
- 2.5.2 Flanged openings shall be covered with wood or plastic protectors. Protectors shall be installed with not less than four (4) full diameter steel bolts and nuts of compatible material with the flange.
- 2.5.3 Threaded connections and tapped holes shall be capped or plugged. Compatible materials shall be used to prevent thread damage.
- 2.5.4 Pump Unit Assemblies shall be shipped fully assembled on baseplate.
- 2.5.5 Bracing, supports and rigging connections shall be provided to prevent damage during shipment, lifting and unloading.
- 2.5.6 Separate or loose parts shall be boxed. The box shall be attached to the main item to be shipped as a unit.

All shipping containers shall be identified by Seller's order number, equipment number and equipment description.

PART 3 EXECUTION

(Not Used)

END OF SECTION

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ATTACHMENT A


FLUOR DANIEL
DATA SHEET

 U.S. Department of Energy
 Hanford Waste Vitrification Plant
 Richland, Washington
 DOE Contract DE-AC06-86RL10838

CENTRIFUGAL PUMPS

NO. △ △ △ △ △ △	BY DATE	REVISION	SHEET NO. P33B-DS-1	REV. 0
			DATE 03-07-90	CONTRACT 845734
			TAG NO. PX-450-001A PX-450-001B	
			SPECIFICATION SECT NO. 15141	
			FOR CLIENT USE	
			DRG BY S. Strausburg	CHK'D KJM

 ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: **H-2-123354-1 (SS 15141)**

Service PROCESS COOLING WATER	No. Motor Driven 2	PUMP MATERIALS
Pump Mfr. _____	Pump Tag No. PX-450-001A PX-450-001B	Casing 304L SS
Size & Type PROCESS COOLING WATER PUMP	Motor Tag No. SAME	Impeller 304L SS
No. Stages _____	Motor Provided By MANUFACTURER	Internal Parts 304L SS
Serial No. _____		No. Pumps Req 2
		No. Turbine Driven _____

LIQUID	OPERATING CONDITIONS	SITE CONDITIONS
Name WATER	Capacity (U.S. GPM): Normal 1691 Rated 2000	Temp. (°F): Max. _____ Min. _____
Pumping Temperature (°F): Normal 80 Max. 150 Min. _____	Discharge Pressure (PSIG): 72	Rel. Humid. (%): Max. _____ Min. _____
Specific Gravity: @ 80 °F = 1	Suction Pressure (PSIG): Max. 1.9 Rated 1.4	Altitude (Feet): _____
Vapor Press. (PSIA): 0.5	Differential Pressure (PSI): 70.6	<input type="radio"/> Indoor <input type="radio"/> Heated <input type="radio"/> Roof
Viscosity (CP): @ 80 °F = 0.8	Differential Head (Feet): 158.6	<input type="radio"/> Outdoor <input type="radio"/> Unheated <input type="radio"/> Sun
Corrosion/Erosion Caused By: _____	NPSH Available (Feet): 30+	Area Classification: _____
NITRIC ACID DECONTAMINATION	Hydraulic Power (HP): 82	Other: _____
Remarks: _____		Remarks: 1 OPERATING, 1 SPARE 400 GPM MINIMUM FLOW (ESTIMATED)

PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.: _____	Minimum Continuous Flow (GPM): _____	NPSH Required (Feet Water): _____
Speed (RPM): _____	Thermal _____ Stable _____	3% Head Drop _____
Efficiency (%): _____	Max. Head Rated Imp. (Feet): _____	Suction Specified Speed: _____
Rated Power (BHP): _____	Max. Power Rated Imp. (BHP): _____	

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONNECTIONS	SIZE	TYPE
Suction					Drain		
Discharge					Vent		
					Pressure Gage		
					Warm Up		
					Balance Line		

Casing Mount: <input type="checkbox"/> Foot <input type="checkbox"/> Bracket Centerline <input type="checkbox"/> Near Cntrl. <input type="checkbox"/> Inline Casing Split: <input type="checkbox"/> Axial <input type="checkbox"/> Radial Casing Type: <input type="checkbox"/> Diffuser <input type="checkbox"/> Staggered <input type="checkbox"/> Single Volute <input type="checkbox"/> Double Volute Max. Allowable Pressure (PSIG): At 60°F _____ At Nom. Pump Temp. _____ Hydro Test Pressure (PSIG): _____ Lubrication Type: <input type="checkbox"/> API 614 <input type="checkbox"/> Grease <input type="checkbox"/> Ring Oil <input type="checkbox"/> Oil Mist <input type="checkbox"/> Flood <input type="checkbox"/> Flinger <input type="checkbox"/> Pressure Remarks: _____	Impeller Diameter (Inches) Rated _____ Max. _____ Min. _____ Impeller Type: <input type="checkbox"/> Open <input type="checkbox"/> Closed Imp. Suction: <input type="checkbox"/> Single <input type="checkbox"/> Double Imp. Mount: <input type="checkbox"/> Btwn. Brgs <input type="checkbox"/> Overhung Rotation (Coupling End): <input type="checkbox"/> CW <input type="checkbox"/> CCW Bearing (Type/Number): Radial _____ Thrust _____ Coupling: Manufacturer _____ Type/Model _____ Driver Half-Coupling Mounted By: <input type="radio"/> Pump Mfr. <input type="radio"/> Driver Mfr. <input type="radio"/> Purchaser	Packing: Manufacturer _____ Type _____ Size/No. Rings _____ Mechanical Seal: API Class code _____ Manufacturer _____ Model _____ Mfr. Code _____ <input type="radio"/> Cartridge Type Required Gland Type/Mat'l.: _____ Gland Plate Taps Required for:
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☐ = By Purchaser ☐ = By Mfr./Purchaser ☐ Quench ☐ Flush ☐ Drain ☐ Vent

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ATTACHMENT A

**FLUOR DANIEL****DATA SHEET**

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

CENTRIFUGAL PUMPS

NO. △ △ △ △ △ △	BY DATE	REVISION	SHEET NO. P33B-DS-2	REV. 0
			DATE 03-19-90	CONTRACT 845734
			TAG NO. PX-460-001A PX-460-001B	
			SPECIFICATION SECT NO. 15141	
			FOR CLIENT USE	
			ORIG BY S. Strausburg	CHK'D KJM

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: **H-2-123354-1 (SS 15141)**

Service MELTER COOLING WATER	No. Motor Driven 2	PUMP MATERIALS
Pump Mfr. PX-460-001A PX-460-001B	Pump Tag No. PX-460-001A PX-460-001B	Casing 304L SS
Size & Type MELTER COOLING WATER	Motor Tag No. SAME	Impeller 304L SS
No. Stages	Motor Provided By MANUFACTURER	Internal Parts 304L SS
Serial No.		No. Pumps Req 2
		No. Turbine Driven

LIQUID	OPERATING CONDITIONS	SITE CONDITIONS
Name WATER	Capacity (U.S. GPM): Normal 374 Rated 420	Temp. (°F): Max. Min.
Pumping Temperature (°F): Normal 115 Max. 150 Min. 84	Discharge Pressure (PSIG): 51	Rel. Humid. (%): Max. Min.
Specific Gravity: @ 115 °F = 0.99	Suction Pressure (PSIG): Max. 4.9 Rated 3.6	Altitude (Feet):
Vapor Press. (PSIA): 1.5	Differential Pressure (PSI): 47.4	<input type="radio"/> Indoor <input type="radio"/> Heated <input type="radio"/> Roof
Viscosity (CP): @ 115 °F = 0.6	Differential Head (Feet): 109.3	<input type="radio"/> Outdoor <input type="radio"/> Unheated <input type="radio"/> Sun
Corrosion/Erosion Caused By: NITRIC ACID DECONTAMINATION	NPSH Available (Feet): 25+	Area Classification:
Remarks:	Hydraulic Power (HP): 11.5	Other:
		Remarks: 1 OPERATING, 1 SPARE 84 GPM MINIMUM FLOW

PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.:	Minimum Continuous Flow (GPM):	NPSH Required (Feet Water):
Speed (RPM):	Thermal Stable	3% Head Drop
Efficiency (%):	Max. Head Rated Imp. (Feet):	Suction Specified Speed:
Rated Power (BHP):	Max. Power Rated Imp. (BHP):	

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONNECTIONS	SIZE	TYPE
Suction					Drain		
Discharge					Vent		
Casing Mount: <input type="checkbox"/> Foot <input type="checkbox"/> Bracket			Impeller Diameter (Inches) Rated Max. Min.		Pressure Gage		
Centerline <input type="checkbox"/> Near Cntrl. <input type="checkbox"/> Inline			Impeller Type: <input type="checkbox"/> Open <input type="checkbox"/> Closed		Warm Up		
Casing Split: <input type="checkbox"/> Axial <input type="checkbox"/> Radial			Imp. Suction: <input type="checkbox"/> Single <input type="checkbox"/> Double		Balance Line		
Casing Type: <input type="checkbox"/> Diffuser <input type="checkbox"/> Staggered			Imp. Mount: <input type="checkbox"/> Btwn. Brgs <input type="checkbox"/> Overhung		Packing:		
<input type="checkbox"/> Single Volute <input type="checkbox"/> Double Volute			Rotation (Coupling End): <input type="checkbox"/> CW <input type="checkbox"/> CCW		Manufacturer		
Max. Allowable Pressure (PSIG): At 60°F			Bearing (Type/Number): Radial Thrust		Type		
At Nom. Pump Temp.			Coupling:		Size/No. Rings		
Hydro Test Pressure (PSIG):			Manufacturer		Mechanical Seal:		
Lubrication Type: <input type="checkbox"/> API 614			Type/Model		API Class code		
<input type="checkbox"/> Grease <input type="checkbox"/> Ring Oil <input type="checkbox"/> Oil Mist			Driver Half-Coupling Mounted By:		Manufacturer		
<input type="checkbox"/> Flood <input type="checkbox"/> Flinger <input type="checkbox"/> Pressure			<input type="radio"/> Pump Mfr. <input type="radio"/> Driver Mfr. <input type="radio"/> Purchaser		Model		
Remarks:					Mfr. Code		
					<input type="radio"/> Cartridge Type Required		
					Gland Type/Mat'l.:		
					Gland Plate Taps Required for:		

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○ = By Purchaser □ = By Mfr./Purchaser ○ Quench ○ Flush ○ Drain ○ Vent

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ATTACHMENT B
EQUIPMENT MAXIMUM ENVELOPE
AND MODEL NUMBER OR EQUAL

TAG NUMBER	MODEL NUMBER*	MAXIMUM ENVELOPE (inches)		
		LENGTH	WIDTH	HEIGHT
PX-450-001A	Goulds 3410M Size 8 x 10 - 14	70	34	29
PX-450-001B	Goulds 3410M Size 8 x 10 - 14	70	34	29
PX-460-001A	Goulds 3700M Size 4 x 6 - 13N	72.5	30	33 1/4
PX-460-001B	Goulds 3700M Size 4 x 6 - 13N	52	15	25

*Equipment shall be of this model number or equal.

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U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 15145
SUMP PUMPS
B-595-P-P33B-15145

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA YES NO X
QUALITY LEVEL I II X
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

CHECKER:

J. J. Ichkhan 1/26/93
J. J. Ichkhan, Mechanical Engineer Date

D. A. Buzzelli 1-26-93
D. A. Buzzelli, Lead Disc. Checker Date

APPROVED BY:

R. B. Erickson
C. J. Divona Lead Discipline Engineer

1-26-93
Date

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SECTION 15145
SUMP PUMPS
B-595-P-P33B-15145

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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>
A	DATA SHEETS
B	EQUIPMENT MAXIMUM ENVELOPE AND MODEL NUMBER OR EQUAL

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SECTION 15145
SUMP PUMPS

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the technical requirements for the design, fabrication, inspection and testing of sump pumps. Each pump consists of a pump, electric motor driver and coupling assembly.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B36.19M 1985 Stainless Steel Pipe

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A312/A312M 1991 Standard Specification for
Seamless and Welded Austenitic
Stainless Steel Pipes

ASTM A403/A403M 1991 Standard Specification for Wrought
Austenitic Stainless Steel Piping
Fittings

ASTM A747/A747M 1989 Standard Specification for Steel
Castings, Stainless, Precipitation
Hardening

ANTI-FRICTION BEARING MANUFACTURERS ASSOCIATION (AFBMA)

AFBMA 9 1990 Load Ratings and Fatigue Life for
Ball Bearings

AFBMA 11 1990 Load Ratings and Fatigue Life for
Roller Bearings

HYDRAULIC INSTITUTE (HI)

HI 1983 Standard for Centrifugal, Rotary
and Reciprocating Pumps, 14th Edition

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characteristics. These calculations shall be complete and in sufficient detail to permit a second party review.

1.6.2.2 Descriptive Literature - Descriptive literature shall be provided. This literature shall include equipment ratings, model numbers, operating characteristics and technical descriptions.

1.6.2.3 Data Sheets - Seller shall submit completed data sheets for the furnished equipment. These data sheets shall reflect the design parameters in Data Sheets DS-1 through DS-4 (Attachment A).

1.6.2.4 Pump Performance Curves - Pump performance curves as described in Paragraph 2.4 shall be provided for the pump. These curves shall include pump brake horsepower, efficiency, Net Positive Suction Head (NPSH) required, viscosity and specific gravity corrections.

1.6.2.5 Factory Acceptance Tests (FATs) as defined in Paragraph 2.4.

1.6.3 Spare Parts List

A list of recommended spare parts for one (1) year operation shall be supplied. The spare parts list shall include sufficient data to permit procurement from the original manufacturer or any subsupplier.

1.6.4 Operation and maintenance manuals shall be provided for the sump pumps furnished in accordance with this specification section. Manuals shall fully detail sequences of disassembly, repair, adjustment, reassembly, lubrication, and trouble-shooting. Trouble-shooting sections shall include fault trees to guide both mechanical and electrical diagnostics. Reduced-size copies of those assembly, subassembly drawings and parts lists needed for routine maintenance and overhaul shall be included. Data to be submitted in accordance with Specification Section 01730. Complete installation manuals shall also be submitted.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

- | | | |
|----|-------------------------------|--------------------------|
| A. | Site Elevation | 714 feet above sea level |
| B. | Barometric Pressure | 14.3 psia |
| C. | Outside Design Temperature | |
| | 1) Maximum Design Temperature | 110°F |

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OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

OSHA Standard 1978 Guards for Rotating Equipment
Instruction 1-12.14

1.3 RELATED REQUIREMENTS

Specification Section 01730 Operation and Maintenance Data

Specification Section 15196 Identification and Tagging Methods
for Mechanical Equipment

Specification Section 16150 Motors - Induction for General
Service

1.4 DEFINITIONS

FAT - Factory Acceptance Test

NPSH - Net Positive Suction Head

TEFC - Totally Enclosed Fan Cooled

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with Vendor Drawing and Data Requirements Drawings section of the Order/Subcontract.

1.6.1 Dimensional outline drawings showing equipment support data, equipment and performance data (including performance curves) shall be submitted for Buyer approval. Drawings shall also include dimensions, shipping and operating weights, clearances which must be maintained, size and location of all connections including anchorage, lifting supports, material of construction, corrosion allowance and base frame (including its thickness). Sectional drawings showing inside construction and details for each component shall also be provided. Drawings shall include a detailed Bill of Materials listing manufacturer, type and ratings of all component parts or assemblies. The pump discharge and suction nozzle allowable loads shall be furnished with these documents.

1.6.2 Technical Data

1.6.2.1 Design Calculations - Seller shall provide engineering design analysis with supporting calculations used to establish connected horsepower requirements, shaft sizes, bearing loads and operating

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2) Minimum Design Temperature -20°F

3) Wet Bulb Design Temperature 68°F

D. Operating Environment

1) Normal Temperature 60°F to 104°F

2) Maximum Temperature 104°F

3) Relative Humidity Not controlled

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 General Requirements

Sump pump assemblies shall be furnished by a manufacturer normally engaged in the production of submerged sump pumps. Pumps furnished in accordance with this specification section shall be a standard production of sump pumps. Sump pump unit assembly including specified accessories, instrumentation and controls shall be designed and constructed in accordance with the requirements of the Hydraulic Institute (HI).

All exposed moving parts shall have heavy-duty, removable guards provided in accordance with OSHA Standard Instruction 1-12.14.

2.1.2 Pump Casing

Pump casing shall be 304L stainless steel in accordance with ASTM A747/A747M. The volute and discharge nozzle of the pump casing shall be cast in one piece. The casing shall be designed to withstand a hydrostatic pressure of not less than 1-1/2 times the design shutoff head of the pump.

2.1.3 Impeller

The impeller shall be 304L stainless steel in accordance with ASTM A747/A747M open type. The impeller shall be dynamically balanced.

2.1.4 Strainer

The pump intake shall be protected with a 304L stainless steel slotted intake strainer with an effective free area sufficient to prevent cavitation and degradation of efficiency. Strainer shall have a free area of at least four times the cross-sectional area of the suction casing.

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2.1.5 Pump Shaft

Pump shaft shall be constructed of ground and polished 304L stainless steel with hardened wearing surfaces at intermediate shaft bearing locations. The mechanical properties and diameter of the shaft shall ensure that whip, deflection or vibration will not be of sufficient magnitude to impose greater than design loads on the specified shaft bearings under normal operating conditions. Means shall be provided for external adjustment of the clearance between the impeller and the inner surface of the volute.

2.1.6 Bearings and Lubrication

Ball or roller bearings shall be furnished for the motor support housing above the cover plate surface, with full provision for the mechanical and hydraulic radial and thrust loads imposed. Bearings shall be sealed and grease lubricated and shall have an L-10 rating of not less than 100,000 hours life in accordance with AFBMA 9 or AFBMA 11.

Intermediate shaft bearings shall be of the sleeve type. The center distance between any two bearings on the shaft shall not exceed 4 feet 6 inches when operating at 1750 RPM. Sleeve bearing length shall be not less than 2 times the shaft diameter. A sleeve bearing located near the lower extremity of the shaft shall be provided. Sleeve bearings shall be 304L stainless steel and provided with centralized grease lubricators manually operated from a single point.

2.1.7 Flexible Couplings

Pump shaft shall be connected to the motor shaft through a flexible coupling. The flexible coupling shall act as a dielectric connector, shall not transmit vibrations or end thrust, and shall permit up to 4 degrees misalignment under normal duty.

2.1.8 Support Pipe

A 304L stainless steel support pipe in accordance both with ASTM A312/A312M and ANSI B36.19M concentric with the pump shaft shall connect the pump to the sump cover plate. The support pipe flanges shall be machined and doweled to ensure proper alignment of the pump and shaft whenever the pipe is disassembled and reassembled in the field. The flanges shall be 304L stainless steel in accordance with ASTM A403/A403M.

2.1.9 The pump support plate shall have provisions to be anchored to the sump cover plate with a minimum of four 3/8 inch diameter bolts. Bolt holes shall be 7/16 inch diameter.

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2.1.10 Discharge Pipe

A discharge pipe running from the pump discharge outlet to the sump cover plate shall be furnished as an integral part of the pump unit. The discharge pipe shall be arranged to prevent discharge piping beyond the pump assembly from imposing loads which could cause shaft misalignment. The pipe shall be 304L stainless steel in accordance both with ASTM A312/A312M and ANSI B36.19M. The discharge end of the pipe shall terminate in a 304L stainless steel flanged connection in accordance with ASTM A403/A403M.

2.2 FABRICATION AND MANUFACTURE

2.2.1 General Requirements

The pump operating point shall be within 10 percent of the peak efficiency on the pump performance curve. At design conditions and at maximum horsepower along the pump curve, the horsepower requirements shall not exceed the nominal rating of the motor as shown on the nameplate (excluding service factor). All rotating parts of the assembled equipment shall operate throughout the required range without excessive vibration, thrust, or noise. The noise level shall not exceed 85 dB at 3 feet peripheral around the pump assembly.

2.2.2 Pump Casing

Pump casing shall be designed for the maximum discharge pressure at pumping temperature and hydrostatic test pressure at ambient temperature as shown on the pump data sheet (Attachment A).

2.2.3 Materials

Pump casing shall be 304L stainless steel in accordance with ASTM A747/A747M. Impeller shall be 304L stainless steel in accordance with ASTM A747/A747M. Casting shall be sound, free from shrink or blow holes, seals, blisters and other defects. The surfaces shall be cleaned by manufacturer's standard method. All casting burrs shall be filed or ground flush with the surface of the casting. The repair of leaks and defects in pressure casings by the use of plastic or cement compounds is not acceptable.

2.2.4 Bearings

Bearings shall be sized to take the thrust loads of 150 percent of rated capacity at maximum speed. The life for antifriction bearings specified therein shall be L-10 of 100,000 hours service life calculated in accordance both with AFBMA 9 and AFBMA 11.

2.2.5 Vibration

Peak-to-peak vibration limits shall cover rotor vibration during shop and field tests at rated speed and throughout the full operating capacity. Peak-to-peak limits measured on the shaft are:

SPEED RPM	ANTIFRICTION BEARINGS (1)	SLEEVE BEARINGS (2)
1800 and below	mils 1.5	mils 1.5
(1) measured on bearing housing (2) measured on the shaft		

2.2.6 Coupling

Pump manufacturer shall mount pump and motor half couplings. Couplings shall be rated for a minimum of 150 percent of motor nameplate horsepower at design RPM. All metal flexible couplings shall be keyed to both shafts and shall be dielectric.

2.2.7 Motor

Motor shall be vertical induction type motor, 3500 RPM Totally Enclosed Fan Cooled (TEFC), squirrel cage, having normal starting and break down torque. Motor shall be in accordance with Specification Section 16150.

2.2.8 Maximum envelope sizes and model numbers of equipment (or equal) are listed in Attachment B.

2.3 COATINGS

Electrical motor and exposed parts of the support frame for the pump shall be painted with recommended manufacturer standards. Stainless steel, plastics and elastomers shall not be painted unless specified otherwise.

2.4 FACTORY ACCEPTANCE TESTS (FATS)

- A. Seller shall shop test the unit to verify pump performance. A detailed shop testing procedure shall be submitted for Buyer approval prior to testing. Buyer shall be notified in advance of all source testing and shall be allowed to witness all tests (FATs).
- B. Pump shall be tested at the factory to provide detailed performance data and demonstrate its conformance with specifications. The pump shall be hydrostatically tested for a period of time not less than 30 minutes. The test pressure

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shall be not less than one and one-half times the head capabilities of the maximum diameter impeller for the casing at shutoff, plus the pump maximum allowable suction head. In no case shall the test pressure be less than 250 psig. Pump casing shall be tight at the test pressure. During the test, no visually detectable leakage shall occur at any joint.

- C. Seller shall furnish certified shop test curves and FAT reports. These shall show pump head-capacity, efficiency and brake horsepower.

2.5 LABELING

Labeling shall be in accordance with Specification Section 15196, Paragraph 2.2.2, Type 6. This shall be in addition to the manufacturer's identification plate.

Pump shall be provided with a cast in or permanently attached direction of rotation arrow located on drive end of the pump.

2.6 PACKAGING

Preparation for shipment and packing shall conform to Seller's standards. At minimum, packaging shall provide protection against corrosion and damage during normal handling, shipping and storage. Minimum preparation shall include the requirements listed below.

- 2.6.1 Machined surfaces, threads, bearings and bearing housings shall be protected during shipment by application of grease or other suitable rust inhibiting compound.
- 2.6.2 Flanged openings shall be covered with wood or plastic protectors. Protectors shall be installed with a minimum of four (4) full diameter steel bolts and nuts of compatible material with the flange.
- 2.6.3 Threaded connections and tapped holes shall be capped or plugged using compatible materials to prevent thread damage.
- 2.6.4 Sump Pump Unit Assembly shall be shipped fully assembled.
- 2.6.5 Bracing, supports and rigging connections shall be provided to prevent damage during shipment, lifting and unloading.
- 2.6.6 Separate or loose parts shall be completely boxed and attached to the main item to be shipped as a unit. All shipping boxes shall be identified by the Seller's order number, equipment number, and equipment description in ink, paint, or other indelible material.
- 2.6.7 One complete set of installation, operating and maintenance instructions shall be packed with each assembly.

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PART 3 EXECUTION

(Not Used)

END OF SECTION

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ATTACHMENT A

**FLUOR DANIEL****DATA SHEET**

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

SUMP PUMPS

NO. △ △ △ △ △ △ △	BY DATE	REVISION	SHEET NO. P33B-DS-1	REV. 0
			DATE 03-16-89	CONTRACT 845734
			TAG NO. PX-520-002	
			SPECIFICATION SECT NO. 15145	
			FOR CLIENT USE	
			ORIG BY HBJO	CHK'D SSL

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: **SS 15145**

Service FLOOR DRAIN CATCH TANK SUMP PUMP	No. Motor Driven 1	PUMP MATERIALS
Pump Mfr. _____	Pump Tag No. PX-520-002	Casing 304L S.S.
Size & Type _____	FLOOR DRAIN CATCH TANK SUMP PUMP	Impeller 304L S.S.
No. Stages _____	Motor Tag No. SAME	Internal Parts 304L S.S.
Serial No. _____	Motor Provided By MANUFACTURER	No. Pumps Req 1
		No. Turbine Driven _____

LIQUID	OPERATING CONDITIONS	SITE CONDITIONS
Name WASTE WATER	Capacity (U.S. GPM): Normal 10 Rated 10	Temp. (°F): Max. _____ Min. _____
Pumping Temperature (°F): Normal 70 Max. 210 Min. _____	Discharge Pressure (PSIG): 49	Rel. Humid. (%): Max. _____ Min. _____
Specific Gravity: @ 70 °F = 0.9990	Suction Pressure (PSIG): Max. _____ Rated 0	Altitude (Feet): _____
Vapor Press. (PSIA): 0.36	Differential Pressure (PSI): 49	<input type="radio"/> Indoor <input type="radio"/> Heated <input type="radio"/> Roof
Viscosity (CP): @ 70 °F = 0.98	Differential Head (Feet): 114	<input type="radio"/> Outdoor <input type="radio"/> Unheated <input type="radio"/> Sun
Corrosion/Erosion Caused By: _____	NPSH Available (Feet): N/A	Area Classification: 3
Remarks: _____	Hydraulic Power (HP): 0.3	Other: _____
		Remarks: _____

PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.: _____	Minimum Continuous Flow (GPM): _____	NPSH Required (Feet Water): _____
Speed (RPM): _____	Thermal _____ Stable _____	3% Head Drop _____
Efficiency (%): _____	Max. Head Rated Imp. (Feet): _____	Suction Specified Speed: _____
Rated Power (BHP): _____	Max. Power Rated Imp. (BHP): _____	

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONNECTIONS	SIZE	TYPE
Suction					Drain		
Discharge					Vent		
					Pressure Gage		
					Warm Up		
					Balance Line		

Casing Mount: <input type="checkbox"/> Foot <input type="checkbox"/> Bracket	Impeller Diameter (Inches) Rated _____ Max. _____ Min. _____	Packing: Manufacturer _____ Type _____ Size/No. Rings _____ Mechanical Seal: API Class code _____ Manufacturer _____ Model _____ Mfr. Code _____ <input type="radio"/> Cartridge Type Required Gland Type/Mat'l.: _____ Gland Plate Taps Required for: _____
Centerline <input type="checkbox"/> Near Cntrl. <input type="checkbox"/> Inline	Rated _____ Max. _____ Min. _____	
Casing Split: <input type="checkbox"/> Axial <input type="checkbox"/> Radial	Impeller Type: <input type="checkbox"/> Open <input type="checkbox"/> Closed	
Casing Type: <input type="checkbox"/> Diffuser <input type="checkbox"/> Staggered	Imp. Suction: <input type="checkbox"/> Single <input type="checkbox"/> Double	
<input type="checkbox"/> Single Volute <input type="checkbox"/> Double Volute	Imp. Mount: <input type="checkbox"/> Btwn. Brgs <input type="checkbox"/> Overhung	
Max. Allowable Pressure (PSIG): At 60°F _____	Rotation (Coupling End): <input type="checkbox"/> CW <input type="checkbox"/> CCW	
At Nom. Pump Temp. _____	Bearing (Type/Number): Radial _____	
Hydro Test Pressure (PSIG): _____	Thrust _____	
Lubrication Type: <input type="checkbox"/> API 614	Coupling: Manufacturer _____	
<input type="checkbox"/> Grease <input type="checkbox"/> Ring Oil <input type="checkbox"/> Oil Mist	Type/Model _____	
<input type="checkbox"/> Flood <input type="checkbox"/> Flinger <input type="checkbox"/> Pressure	Driver Half-Coupling Mounted By: <input type="radio"/> Pump Mfr. <input type="radio"/> Driver Mfr. <input type="radio"/> Purchaser	

ATTACHMENT A



FLUOR DANIEL

DATA SHEET

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

SUMP PUMPS

NO.	BY	REVISION	SHEET NO.	REV.	
	DATE		P33B-DS-2	0	
			DATE	CONTRACT	
			03-16-89	845734	
			TAG NO.	PX-520-005	
			SPECIFICATION SECT NO.	15145	
			FOR CLIENT USE		
			ORIG BY	CHK'D	APPR'D
			HBJO	SSL	

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: SS 15145

Service <u>ACID DRAIN CATCH TANK</u>	No. Motor Driven <u>1</u>	PUMP MATERIALS
<u>SUMP PUMP</u>		
Pump Mfr. _____	Pump Tag No. <u>PX-520-005</u>	
Size & Type _____	<u>ACID DRAIN CATCH TANK SUMP PUMP</u>	
No. Stages _____	Motor Tag No. <u>SAME</u>	No. Pumps Req <u>1</u>
Serial No. _____	Motor Provided By <u>MANUFACTURER</u>	No. Turbine Driven <u>N/A</u>

LIQUID	OPERATING CONDITIONS	SITE CONDITIONS
Name <u>WASTE WATER</u>	Capacity (U.S. GPM): Normal <u>10</u> Rated <u>10</u>	Temp. (°F): Max. _____ Min. _____
Pumping Temperature (°F): Normal <u>70</u> Max. <u>210</u> Min. _____	Discharge Pressure (PSIG): <u>49</u>	Rel. Humid. (%): Max. _____ Min. _____
Specific Gravity: @ <u>70</u> °F = <u>0.9980</u>	Suction Pressure (PSIG): Max. _____ Rated <u>0</u>	Altitude (Feet): _____
Vapor Press. (PSIA): <u>0.36</u>	Differential Pressure (PSI): <u>49</u>	<input type="radio"/> Indoor <input type="radio"/> Heated <input type="radio"/> Roof
Viscosity (CP): @ <u>70</u> °F = <u>0.98</u>	Differential Head (Feet): <u>114</u>	<input type="radio"/> Outdoor <input type="radio"/> Unheated <input type="radio"/> Sun
Corrosion/Erosion Caused By: _____	NPSH Available (Feet): <u>N/A</u>	Area Classification: <u>3</u>
Remarks: _____	Hydraulic Power (HP): <u>0.3</u>	Other: _____
		Remarks: _____

PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.: _____	Minimum Continuous Flow (GPM): _____	NPSH Required (Feet Water): _____
Speed (RPM): _____	Thermal _____ Stable _____	3% Head Drop _____
Efficiency (%): _____	Max. Head Rated Imp. (Feet): _____	Suction Specified Speed: _____
Rated Power (BHP): _____	Max. Power Rated Imp. (BHP): _____	

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONNECTIONS	SIZE	TYPE
Suction					Drain		
Discharge					Vent		
					Pressure Gage		
					Warm Up		
					Balance Line		

Casing Mount: <input type="checkbox"/> Foot <input type="checkbox"/> Bracket	Impeller Diameter (Inches) Rated _____ Max. _____ Min. _____
Centerline <input type="checkbox"/> Near Cntrl. <input type="checkbox"/> Inline	Impeller Type: <input type="checkbox"/> Open <input type="checkbox"/> Closed
Casing Split: <input type="checkbox"/> Axial <input type="checkbox"/> Radial	Imp. Suction: <input type="checkbox"/> Single <input type="checkbox"/> Double
Casing Type: <input type="checkbox"/> Diffuser <input type="checkbox"/> Staggered	Imp. Mount: <input type="checkbox"/> Btwn. Brgs <input type="checkbox"/> Overhung
<input type="checkbox"/> Single Volute <input type="checkbox"/> Double Volute	Rotation (Coupling End): <input type="checkbox"/> CW <input type="checkbox"/> CCW
Max. Allowable Pressure (PSIG): At 60°F _____	Bearing (Type/Number): Radial _____
At Nom. Pump Temp. _____	Thrust _____
Hydro Test Pressure (PSIG): _____	Coupling: Manufacturer _____
Lubrication Type: <input type="checkbox"/> API 614	Type/Model _____
<input type="checkbox"/> Grease <input type="checkbox"/> Ring Oil <input type="checkbox"/> Oil Mist	Driver Half-Coupling Mounted By: <input type="radio"/> Pump Mfr. <input type="radio"/> Driver Mfr. <input type="radio"/> Purchaser
<input type="checkbox"/> Flood <input type="checkbox"/> Flinger <input type="checkbox"/> Pressure	
Remarks: _____	

Packing: Manufacturer _____
Type _____
Size/No. Rings _____
Mechanical Seal: API Class code _____
Manufacturer _____
Model _____
Mfr. Code _____
<input type="radio"/> Cartridge Type Required
Gland Type/Mat'l.: _____
Gland Plate Taps Required for: <input type="radio"/> Quench <input type="radio"/> Flush <input type="radio"/> Drain <input type="radio"/> Vent

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○ = By Purchaser □ = By Mfr./Purchaser ○ Quench ○ Flush ○ Drain ○ Vent

P33B - 15145

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ATTACHMENT A



FLUOR DANIEL

DATA SHEET

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

SUMP PUMPS

NO.	BY	REVISION	SHEET NO.	REV.
DATE			P33B-DS-3	0
			DATE	CONTRACT
			03-16-89	845734
			TAG NO.	PX-520-007
			SPECIFICATION SECT NO.	15145
			FOR CLIENT USE	
			ORG BY	CHK'D
			HBJO	SSL
			APPR'D	

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: SS 15145

Service <u>ORGANIC ACID DRAIN CATCH</u> <u>TANK SUMP PUMP</u>	No. Motor Driven <u>1</u>	PUMP MATERIALS Casing <u>304L S.S.</u> Impeller <u>304L S.S.</u> Internal Parts <u>304L S.S.</u> No. Pumps Req <u>1</u> No. Turbine Driven _____
Pump Mfr. _____	Pump Tag No. <u>PX-520-007</u>	
Size & Type _____	<u>ORGANIC ACID DRAIN CATCH TANK</u> <u>SUMP PUMP</u>	
No. Stages _____	Motor Tag No. <u>SAME</u>	
Serial No. _____	Motor Provided By <u>MANUFACTURER</u>	

LIQUID	OPERATING CONDITIONS	SITE CONDITIONS
Name <u>WASTE WATER</u>	Capacity (U.S. GPM): Normal <u>10</u> Rated <u>10</u>	Temp. (°F): Max. _____ Min. _____
Pumping Temperature (°F): Normal <u>70</u> Max. <u>210</u> Min. _____	Discharge Pressure (PSIG): <u>49</u>	Rel. Humid. (%): Max. _____ Min. _____
Specific Gravity: @ <u>70</u> °F = <u>0.9980</u>	Suction Pressure (PSIG): Max. _____ Rated <u>0</u>	Altitude (Feet): _____
Vapor Press. (PSIA): <u>0.35</u>	Differential Pressure (PSI): <u>49</u>	<input type="radio"/> Indoor <input type="radio"/> Heated <input type="radio"/> Roof
Viscosity (CP): @ <u>70</u> °F = <u>0.88</u>	Differential Head (Feet): <u>114</u>	<input type="radio"/> Outdoor <input type="radio"/> Unheated <input type="radio"/> Sun
Corrosion/Erosion Caused By: _____	NPSH Available (Feet): <u>N/A</u>	Area Classification: <u>3</u>
Remarks: _____	Hydraulic Power (HP): <u>0.3</u>	Other: _____
		Remarks: _____

PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.: _____	Minimum Continuous Flow (GPM): _____	NPSH Required (Feet Water): _____
Speed (RPM): _____	Thermal _____ Stable _____	3% Head Drop _____
Efficiency (%): _____	Max. Head Rated Imp. (Feet): _____	Suction Specified Speed: _____
Rated Power (BHP): _____	Max. Power Rated Imp. (BHP): _____	

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONNECTIONS	SIZE	TYPE
Suction					Drain		
Discharge					Vent		
					Pressure Gage		
					Warm Up		
					Balance Line		

Casing Mount: <input type="checkbox"/> Foot <input type="checkbox"/> Bracket	Impeller Diameter (Inches) Rated _____ Max. _____ Min. _____
Centerline <input type="checkbox"/> Near Cntrl. <input type="checkbox"/> Inline	Impeller Type: <input type="checkbox"/> Open <input type="checkbox"/> Closed
Casing Split: <input type="checkbox"/> Axial <input type="checkbox"/> Radial	Imp. Suction: <input type="checkbox"/> Single <input type="checkbox"/> Double
Casing Type: <input type="checkbox"/> Diffuser <input type="checkbox"/> Staggered	Imp. Mount: <input type="checkbox"/> Btwn. Brgs <input type="checkbox"/> Overhung
<input type="checkbox"/> Single Volute <input type="checkbox"/> Double Volute	Rotation (Coupling End): <input type="checkbox"/> CW <input type="checkbox"/> CCW
Max. Allowable Pressure (PSIG): At 60°F _____	Bearing (Type/Number): Radial _____
At Nom. Pump Temp. _____	Thrust _____
Hydro Test Pressure (PSIG): _____	Coupling: Manufacturer _____
Lubrication Type: <input type="checkbox"/> API 614	Type/Model _____
<input type="checkbox"/> Grease <input type="checkbox"/> Ring Oil <input type="checkbox"/> Oil Mist	Driver Half-Coupling Mounted By: <input type="radio"/> Pump Mfr. <input type="radio"/> Driver Mfr. <input type="radio"/> Purchaser
<input type="checkbox"/> Flood <input type="checkbox"/> Flinger <input type="checkbox"/> Pressure	
Remarks: _____	

Packing: Manufacturer _____ Type _____ Size/No. Rings _____
Mechanical Seal: API Class code _____ Manufacturer _____ Model _____ Mfr. Code _____
<input type="radio"/> Cartridge Type Required
Gland Type/Mat'l.: _____
Gland Plate Taps Required for: <input type="radio"/> Quench <input type="radio"/> Flush <input type="radio"/> Drain <input type="radio"/> Vent

ATTACHMENT A



DATA SHEET

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

SUMP PUMPS

NO. △ △ △ △ △ △	BY DATE	REVISION	SHEET NO. P33B-DS-4	REV 0
			DATE 03-16-89	CONTRACT 845734
			TAG NO. PX-520-008	
			SPECIFICATION SECT NO. 15145	
			FOR CLIENT USE	
			ORIG BY HB/O	CHK'D SSL

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: **SS 15145**

Service REGULATED DRAINS CATCH TANK SUMP PUMP	No. Motor Driven 1	PUMP MATERIALS Casing 304L S.S. Impeller 304L S.S. Internal Parts 304L S.S. No. Pumps Req 1 No. Turbine Driven
Pump Mfr.	Pump Tag No. PX-520-008	
Size & Type	REGULATED DRAINS CATCH TANK SUMP PUMP	
No. Stages	Motor Tag No. SAME	
Serial No.	Motor Provided By MANUFACTURER	

LIQUID Name WASTE WATER Pumping Temperature (°F): Normal 70 Max. 210 Min. Specific Gravity: @ 70 °F = 0.9990 Vapor Press. (PSIA): 0.36 Viscosity (CP): @ 70 °F = 0.99 Corrosion/Erosion Caused By: Remarks:	OPERATING CONDITIONS Capacity (U.S. GPM): Normal 10 Rated 10 Discharge Pressure (PSIG): 49 Suction Pressure (PSIG): Max. Rated 0 Differential Pressure (PSI): 49 Differential Head (Feet): 114 NPSH Available (Feet): N/A Hydraulic Power (HP): 0.3	SITE CONDITIONS Temp. (°F): Max. Min. Rel. Humid. (%): Max. Min. Altitude (Feet): <input type="radio"/> Indoor <input type="radio"/> Heated <input type="radio"/> Roof <input type="radio"/> Outdoor <input type="radio"/> Unheated <input type="radio"/> Sun Area Classification: 3 Other: Remarks:
--	---	--

PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.:	Minimum Continuous Flow (GPM):	NPSH Required (Feet Water):
Speed (RPM):	Thermal Stable	3% Head Drop
Efficiency (%):	Max. Head Rated Imp. (Feet):	Suction Specified Speed:
Rated Power (BHP):	Max. Power Rated Imp. (BHP):	

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONNECTIONS	SIZE	TYPE
Suction					Drain		
Discharge					Vent		
					Pressure Gage		
					Warm Up		
					Balance Line		

Casing Mount: <input type="checkbox"/> Foot <input type="checkbox"/> Bracket Centerline <input type="checkbox"/> Near Cntrl. <input type="checkbox"/> Inline Casing Split: <input type="checkbox"/> Axial <input type="checkbox"/> Radial Casing Type: <input type="checkbox"/> Diffuser <input type="checkbox"/> Staggered <input type="checkbox"/> Single Volute <input type="checkbox"/> Double Volute Max. Allowable Pressure (PSIG): At 60°F At Nom. Pump Temp. Hydro Test Pressure (PSIG): Lubrication Type: <input type="checkbox"/> API 614 <input type="checkbox"/> Grease <input type="checkbox"/> Ring Oil <input type="checkbox"/> Oil Mist <input type="checkbox"/> Flood <input type="checkbox"/> Flinger <input type="checkbox"/> Pressure Remarks:	Impeller Diameter (Inches) Rated Max. Min. Impeller Type: <input type="checkbox"/> Open <input type="checkbox"/> Closed Imp. Suction: <input type="checkbox"/> Single <input type="checkbox"/> Double Imp. Mount: <input type="checkbox"/> Btwn. Brgs <input type="checkbox"/> Overhung Rotation (Coupling End): <input type="checkbox"/> CW <input type="checkbox"/> CCW Bearing (Type/Number): Radial Thrust Coupling: Manufacturer Type/Model Driver Half-Coupling Mounted By: <input type="radio"/> Pump Mfr. <input type="radio"/> Driver Mfr. <input type="radio"/> Purchaser
--	--

Packing: Manufacturer Type Size/No. Rings Mechanical Seal: API Class code Manufacturer Model Mfr. Code <input type="radio"/> Cartridge Type Required Gland Type/Mat'l.: Gland Plate Taps Required for:

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☐ = By Purchaser ☐ = By Mfr./Purchaser ☐ Quench ☐ Flush ☐ Drain ☐ Vent

P33B - 15145

Rev. 0

ATTACHMENT B
EQUIPMENT MAXIMUM ENVELOPE AND
MODEL NUMBER OR EQUAL

TAG NUMBER	MODEL NUMBER*	MAXIMUM ENVELOPE (inches)		
		LENGTH	WIDTH	HEIGHT
PX-520-002	Goulds 3171 Size 1 X 1-1/2 - 6ST	22	22	64
PX-520-005	Goulds 3171 Size 1 X 1-1/2 - 6ST	22	22	64
PX-520-007	Goulds 3171 Size 1 X 1-1/2 - 6ST	22	22	64
PX-520-008	Goulds 3171 Size 1 X 1-1/2 - 6ST	22	22	64

* Equipment shall be of this model number or equal.

690-202146
943202-0697

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 15148
SEALLESS PUMPS
B-595-P-P338-15148

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA YES NO X
QUALITY LEVEL I II X
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

J. J. Ichkhan 1/26/93

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1-26-93
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SECTION 15148
SEALLESS PUMPS
B-595-P-P33B-15148

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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>
A	DATA SHEETS
B	EQUIPMENT MAXIMUM ENVELOPE AND MODEL NUMBER OR EQUAL

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**SECTION 15148
SEALLESS PUMPS**

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the technical requirements for the design, fabrication, inspection and testing of sealless centrifugal pumps.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B73.1M 1984 Horizontal End Suction Centrifugal
Pumps for Chemical Process

**AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
Boiler and Pressure Vessel Code**

ASME Section VIII, 1989 Rules for Construction of Pressure
Division 1 Vessels

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 1990 Structural Welding Code Steel,
12th Edition

ANTI-FRICTION BEARING MANUFACTURERS ASSOCIATION (AFBMA)

AFBMA 9 1990 Edition - Load Ratings and Fatigue
Life for Ball Bearings

AFBMA 11 1990 Edition - Load Ratings and Fatigue
Life for Roller Bearings

HYDRAULIC INSTITUTE (HI)

HI 1983 Standards for Centrifugal, Rotary and
Reciprocating Pumps, 14th Edition

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INSTRUMENT SOCIETY OF AMERICA (ISA)

ISA S20 1981 Specification Forms for Process
Measurement and Control Instruments,
Primary Elements and Control Valves

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

OSHA Standard 1978 Guards for Rotating Equipment
Instruction 1-12.14

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC SP-6 1989 Surface Preparation Specification
No. 6, Commercial Blast Cleaning

1.3 RELATED REQUIREMENTS

Specification Section 01730 Operation and Maintenance Data

Specification Section 15196 Identification and Tagging Methods
for Mechanical Equipment

Specification Section 16150 Motors - Induction for General
Service

1.4 DEFINITIONS

FAT - Factory Acceptance Test
NPSH - Net Positive Suction Head
RPM - Revolutions Per Minute
TEFC - Totally Enclosed Fan Cooled

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and
Data Requirements section of the Order/Subcontract.

1.6.1 Drawings

- 1.6.1.1 A. Certified dimensional outline drawings shall be submitted.
These drawings shall include dimensions, shipping weights,
operating weights and clearances to be maintained. They
shall also show design temperatures and pressures, size and
location of all connections, lifting supports, materials of
construction and corrosion allowances. Drawings which
include the base frame shall include base plate thickness at

the foundation bolts, location of anchor bolts and size of control panel fastenings.

B. Sectional drawings shall be submitted for Buyer approval. These drawings shall show inside arrangement construction and details for each component.

C. Allowable loads on both the pump discharge nozzles and suction nozzles shall be furnished.

All drawings shall include a detailed Bill of Materials. This shall list manufacturer, type and rating of all components.

1.6.2 Technical Data

1.6.2.1 Design Calculations - Seller shall provide an engineering design analysis with supporting calculations used to establish horsepower requirements, shaft sizes, bearing loads and operating characteristics in accordance with data sheets (Attachment A). These calculations shall be sufficiently complete to permit second-party review.

1.6.2.2 Descriptive Literature - Descriptive literature shall be provided. This literature shall include equipment ratings, model numbers, operating characteristics and technical descriptions.

1.6.2.3 Data Sheets

A. Completed data sheets as indicated in P33B-DS-1 through DS-17 (Attachment A).

B. Complete ISA S20 specification forms for process measurement and control instruments, primary elements and control valves.

1.6.2.4 Pump Performance Curves - Pump performance curves shall be provided. These curves shall include pump brake horsepower, efficiency, required net positive suction head (NPSH), viscosity and specific gravity corrections.

1.6.2.5 Nozzle loadings in accordance with ANSI B73.1M.

1.6.2.6 Factory Acceptance Tests (FATs) as defined in Paragraph 2.3.

1.6.3 Spare Parts List

A list of recommended spare parts for one (1) year's routine operation shall be supplied. The spare parts list shall include sufficient data to permit procurement either from original manufacturer or any subsupplier.

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1.6.4 Installation, Operation and Maintenance Manuals

Seller shall provide operation and maintenance manuals. These shall cover the centrifugal sealless pumps furnished in accordance with this specification section. These manuals shall fully detail sequences of disassembly, repair, adjustment, reassembly, lubrication and troubleshooting. Troubleshooting sections shall include fault trees to guide both mechanical and electrical diagnostics. The manuals shall include reduced-size copies of any assembly drawing, subassembly drawing or parts list needed for routine maintenance and overhaul. This data shall be submitted in accordance with Specification Section 01730. Complete installation manuals shall also be submitted.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

- | | | |
|----|--------------------------------|--------------------------|
| A. | Site Elevation | 714 feet above sea level |
| B. | Barometric Pressure | 14.3 psia |
| C. | Outside Design Temperature | |
| | 1) Maximum Design Temperature | 110°F |
| | 2) Minimum Design Temperature | -20°F |
| | 3) Wet Bulb Design Temperature | 68°F |

1.8.2 Operating Environment

- | | | |
|----|---------------------|----------------|
| A. | Normal Temperature | 60°F to 104°F |
| B. | Maximum Temperature | 104°F |
| C. | Relative Humidity | Not controlled |

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 General Requirements

Sealless pumps shall be furnished by a manufacturer normally engaged in the production of industrial sealless pumps. The pump

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furnished in accordance with this specification section shall be a sealless centrifugal pump designed and constructed in accordance with the requirements of ANSI B73.1M. The sealless pump furnished shall have a magnetic drive.

All exposed moving parts shall have heavy-duty removable guards provided in accordance with OSHA Standard Instruction 1-12.14.

Seller shall be responsible for pump design, selection and performance. Pump characteristics and selection shall be in accordance both with ANSI B73.1M and the Hydraulic Institute Standards (HI).

2.1.2 Baseplates and Supports

A fabricated steel drive baseplate shall be furnished for the separate mounted motor pump assembly. The baseplate material shall conform with the pump material. This baseplate shall be designed such that all equipment and auxiliary piping are located within its confines. It shall be rigid enough to maintain pump machinery alignment during shipping without the need for grouting.

Lifting lugs or other arrangements for hoisting and handling the assembled unit during field erection shall be provided.

- A. Pump and motor support pads shall be machined flat and in the same plane within 0.002 inch per foot between pads.
- B. Motor support pads shall be machined to provide a shim height of not less than 3/16 inch.
- C. That portion of the baseplate under the pump shall have a drain pan with raised lip construction. The drain pan shall have a connection at the pump outboard end.
- D. Shaft centerlines shall be of sufficient height above the baseplate to permit piping of all auxiliary connections.
- E. No unit component except the motor conduit box shall overhang the drained area of the baseplate.
- F. Anchor bolt size shall be not less than 3/4-inch diameter.
- G. Pipe supports shall provide piping flexibility and accessibility necessary for proper operation and maintenance.

2.1.3 Maximum envelope sizes and model numbers of equipment or equal are illustrated in Attachment B.

2.2 FABRICATION AND MANUFACTURE

2.2.1 General Requirements

The pump operating point shall be within 10 percent of the peak efficiency on the pump performance curve. Horsepower requirements shall not exceed the nominal rating of the motor as shown on the nameplate at design conditions and at maximum horsepower along the pump curve. This excludes the service factor.

All rotating parts of the assembled equipment shall operate throughout the required range without excessive vibration, thrust or noise. The noise level shall not exceed 85 dB at 3 feet peripheral around the pump skid.

2.2.2 Pump Casing

Pump casings shall be designed for the maximum discharge pressure at pumping temperature and hydrostatic test pressure at ambient temperature. Materials, casting factors and the quality of any welding shall be in accordance with ASME Section VIII, Division 1. Code stamp and data report forms are not required.

2.2.3 Magnetic Drive

The design shall use magnets to ensure non-slip pump operation to 400°F throughout the entire performance range. It shall also have zero leakage.

2.2.4 Materials

Pump casing material shall be in accordance with ANSI B73.1M. The material shall be identified in accordance with this standard. Bearings and shafts shall be Seller's standards for the intended service.

Castings shall be sound. No shrink, blow holes, scale, blisters or other defects shall be permitted. Surfaces shall be cleaned by Seller's standard methods. All casting burrs shall be filed or ground flush with the casting surface. The use of plastic or cement compounds to repair leaks and defects in pressure casings shall not be permitted.

2.2.5 Bearings

Bearings shall be sized to take the thrust loads of 150 percent of rated capacity at maximum speed. The life for antifriction bearings specified therein shall be L-10 of 100,000 hours service life calculated in accordance both with AFBMA 9 and AFBMA 11. The bushings shall provide long internal bearing life across the duty

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range. An internal bushing holder shall be used to ensure correct alignment of the rotating element.

2.2.6 Vibration

Major rotating components such as impellers and balancing drums shall be dynamically balanced in accordance with ANSI B73.1M. Peak-to-peak vibration limits shall apply to all pumps. These limits shall cover rotor vibration during shop and field tests at rated speed throughout the full operating capacity. Peak-to-peak limits measured on the shaft are as follows:

SPEED (RPM)	PEAK-TO-PEAK LIMIT (MILS) (measured on bearing housing)
1800 and below	1.5

2.2.7 Coupling

Pump manufacturer shall mount pump and motor half couplings. Coupling shall be rated for not less than 150 percent of motor nameplate horsepower at design rpm. All metal flexible coupling shall be keyed to both shafts and shall be the dielectric type. Couplings and guards shall be in accordance with OSHA Standard Instruction 1-12.14.

2.2.8 Safety Guarding

All safety guards, color coding, signs, accessibility, etc., shall be in accordance with OSHA Standard Instruction 1-12.14. Safety guards shall be designed such that the guarded equipment is easily accessible for maintenance.

2.2.9 Electric Motors

Transfer switch for emergency power supply is not required.

Motors shall be integral, foot-mounted, Totally Enclosed Fan Cooled (TEFC), squirrel-cage induction type. They shall have normal starting and breakdown torque. Motors shall be in accordance with Specification Section 16150 except as modified herein.

2.2.10 Coatings

After completion of all fabrication procedures the external surfaces of each pump shall be thoroughly cleaned of all foreign material, including rust, in accordance with SSPC SP-6. Manufacturer's standard prime and finish paint or coatings shall be applied. Stainless steel surfaces shall not be painted unless specified otherwise.

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2.2.11 Welding

All pump unit assembly welding requirement for baseplates and supports shall be in accordance with AWS D1.1.

2.2.12 Labeling

Labeling and tagging shall be in accordance with Specification Section 15196, Paragraph 2.2.2, Type 6. This shall be in addition to the manufacturer's identification plate. The pump shall be provided with a cast in or permanently attached direction of rotation arrow located on the drive end of the pump.

2.2.13 Packaging

2.2.13.1 Preparation for shipment and packing shall be in accordance with Seller's standards. At minimum, they shall provide protection against corrosion and damage during normal handling, shipping and storage. Minimum preparation shall include the requirements listed below.

2.2.13.2 Machined surfaces, threads, bearings and bearing housings shall be protected during shipment by application of grease or other suitable rust-inhibiting compound.

2.2.13.3 Flanged openings shall be covered with wood or plastic protectors. Protectors shall be installed with not less than four (4) full diameter steel bolts and nuts of compatible material with the flange.

2.2.13.4 Threaded connections and tapped holes shall be capped or plugged. Compatible materials shall be used to prevent thread damage.

2.2.13.5 Pump Unit Assemblies shall be shipped fully assembled on baseplate.

2.2.13.6 Bracing, supports and rigging connections shall be provided to prevent damage during shipment, lifting and unloading.

2.2.13.7 Separate or loose parts shall be completely boxed. The box shall then be attached to the main item to be shipped as a unit.

All shipping boxes shall be identified by Seller's order number, equipment number and equipment description.

2.3 INSPECTION AND TESTING

Inspection and testing shall be in accordance both with HI Standards and ANSI B73.1M.

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2.3.1 Factory Acceptance Tests (FATs)

2.3.1.1 Seller shall shop test the unit to verify pump performance. A detailed shop testing procedure shall be submitted for Buyer approval before testing begins. Buyer shall be notified in advance of all source testing. Buyer reserves the right to witness all tests (FATs).

2.3.1.2 Pump shall be tested at the factory to provide detailed performance data and demonstrate its conformance to specifications. The pump shall be hydrostatically tested for a period of time not less than 30 minutes. The test pressure shall be not less than one and one-half times the head capabilities of the maximum diameter impeller for the casing at shutoff, plus the pump maximum allowable suction head. In no case shall the test pressure be less than 250 psig. Pump casing shall be tight at the test pressure. During the test no visually-detectable leakage shall occur at any joint.

2.3.1.3 Seller shall furnish certified shop test curves and FAT reports. These curves shall show the pump's head-capacity, efficiency and brake horsepower in accordance with HI Standards.

PART 3 EXECUTION

(Not Used)

END OF SECTION

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**FLUOR DANIEL****DATA SHEET**U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838**SEALLESS PUMPS**

NO.	BY DATE	REVISION	SHEET NO.	REV.
△			P33B-DS-1	0
△			DATE	CONTRACT
△			03-14-90	845734
△			TAG NO.	
△			PX-520-001	
△			SPECIFICATION SECT NO.	
△			15148	
△			ORIG BY	CHK'D
△			HBJO	SSL
△			APPRO	

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: **SS 15148**

FLOOR DRAIN CATCH TANK		PUMP MATERIALS	
Service TRANSFER PUMP	No. Motor Driven 1	Casing 304L S.S.	
Pump Mfr. _____	Pump Tag No. PX-520-001	Impeller 304L S.S.	
Size & Type _____	FLOOR DRAIN CATCH TANK TRANSFER	Internal Parts 304L S.S.	
No. Stages _____	PUMP	No. Pumps Req 1	
Serial No. _____	Motor Tag No. SAME	No. Turbine Driven _____	
	Motor Provided By MANUFACTURER		

LIQUID	OPERATING CONDITIONS	SITE CONDITIONS
Name WASTE/WATER	Capacity (U.S. GPM): Normal 75 Rated 75	Temp. (°F): Max. _____ Min. _____
Pumping Temperature (°F): Normal 70 Max. _____ Min. _____	Discharge Pressure (PSIG): 62	Rel. Humid. (%): Max. _____ Min. _____
Specific Gravity: @ 70 °F = 0.9980	Suction Pressure (PSIG): Max. _____ Rated 0.6	Altitude (Feet): _____
Vapor Press. (PSIA): 0.36	Differential Pressure (PSI): 62	<input type="radio"/> Indoor <input type="radio"/> Heater <input type="radio"/> Roof
Viscosity (CP): @ 70 °F = 0.98	Differential Head (Feet): 144	<input type="radio"/> Outdoor <input type="radio"/> Unheater <input type="radio"/> Sun
Corrosion/Erosion Caused By: _____	NPSH Available (Feet): 33	Area Classification: 3
Remarks: _____	Hydraulic Power (HP): 2.7	Other: _____
		Remarks: _____

PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.: _____	Minimum Continuous Flow (GPM): _____	NPSH Required (Feet Water): _____
Speed (RPM): _____	Thermal _____ Stable _____	3% Head Drop _____
Efficiency (%): _____	Max. Head Rated Imp. (Feet): _____	Suction Specified Speed: _____
Rated Power (BHP): _____	Max. Power Rated Imp. (BHP): _____	

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONNECTIONS	SIZE	TYPE
Suction					Drain		
Discharge					Vent		

Casing Mount: <input type="checkbox"/> Foot <input type="checkbox"/> Bracket	Impeller Diameter (Inches) Rated _____ Max. _____ Min. _____	
Centerline <input type="checkbox"/> Near Cntrl. <input type="checkbox"/> Inline	Impeller Type: <input type="checkbox"/> Open <input type="checkbox"/> Closed	
Casing Split: <input type="checkbox"/> Axial <input type="checkbox"/> Radial	Imp. Suction: <input type="checkbox"/> Single <input type="checkbox"/> Double	
Casing Type: <input type="checkbox"/> Diffuser <input type="checkbox"/> Staggered	Imp. Mount: <input type="checkbox"/> Btwn. Brgs <input type="checkbox"/> Overhung	
<input type="checkbox"/> Single Volute <input type="checkbox"/> Double Volute	Rotation (Coupling End): <input type="checkbox"/> CW <input type="checkbox"/> CCW	
Max. Allowable Pressure (PSIG): At 60°F _____	Bearing (Type/Number): Radial _____	
At Nom. Pump Temp. _____	Thrust _____	
Hydro Test Pressure (PSIG): _____	Coupling: Manufacturer _____	
Lubrication Type: <input type="checkbox"/> API 614	Type/Model _____	
<input type="checkbox"/> Grease <input type="checkbox"/> Ring Oil <input type="checkbox"/> Oil Mist	Driver Half-Coupling Mounted By: <input type="radio"/> Pump Mfr. <input type="radio"/> Driver Mfr. <input type="radio"/> Purchaser	
<input type="checkbox"/> Flood <input type="checkbox"/> Flinger <input type="checkbox"/> Pressure		
Remarks: _____		

Packing: Manufacturer _____	
Type _____	
Size/No. Rings _____	
Mechanical Seal: API Class code _____	
Manufacturer _____	
Model _____	
Mfr. Code _____	
<input type="radio"/> Cartridge Type Required	
Gland Type/Mat'l.: _____	
Gland Plate Taps Required for: <input type="radio"/> Quench <input type="radio"/> Flush <input type="radio"/> Drain <input type="radio"/> Vent	



FLUOR DANIEL DATA SHEET

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

SEALLESS PUMPS

NO.	BY DATE	REVISION	SHEET NO. P33B-DS-2	REV. 0
△			DATE 03-14-90	CONTRACT 845734
△			TAG NO. PX-520-003	
△			SPECIFICATION SECT NO. 15148	
△			ORIG BY HBJO	CHK'D SSL
△			APPR'D	

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: **SS 15148**

REGULATED DRAINS CATCH Service TANK TRANSFER PUMP Pump Mfr. _____ Size & Type _____ No. Stages _____ Serial No. _____	No. Motor Driven 1 Pump Tag No. PX-520-003 REGULATED DRAINS CATCH TANK TRANSFER PUMP Motor Tag No. SAME Motor Provided By MANUFACTURER	PUMP MATERIALS Casing 304L S.S. Impeller 304L S.S. Internal Parts 304L S.S. No. Pumps Req 1 No. Turbine Driven _____
--	---	--

LIQUID Name _____ Pumping Temperature (°F): Normal 70 Max. 120 Min. _____ Specific Gravity: @ 70 °F = 0.9980 Vapor Press. (PSIA): 0.36 Viscosity (CP): @ 70 °F = 0.98 Corrosion/Erosion Caused By: _____ Remarks: _____	OPERATING CONDITIONS Capacity (U.S. GPM): Normal 70 Rated 70 Discharge Pressure (PSIG): 60 Suction Pressure (PSIG): Max. _____ Rated 0.6 Differential Pressure (PSI): 60 Differential Head (Feet): 139 NPSH Available (Feet): 33 Hydraulic Power (HP): 2.5	SITE CONDITIONS Temp. (°F): Max. _____ Min. _____ Rel. Humid. (%): Max. _____ Min. _____ Altitude (Feet): _____ <input type="radio"/> Indoor <input type="radio"/> Heater <input type="radio"/> Roof <input type="radio"/> Outdoor <input type="radio"/> Unheater <input type="radio"/> Sun Area Classification: 3 Other: _____ Remarks: _____
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PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.: _____	Minimum Continuous Flow (GPM): _____	NPSH Required (Feet Water): _____
Speed (RPM): _____	Thermal _____ Stable _____	3% Head Drop _____
Efficiency (%): _____	Max. Head Rated Imp. (Feet): _____	Suction Specified Speed: _____
Rated Power (BHP): _____	Max. Power Rated Imp. (BHP): _____	

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONNECTIONS	SIZE	TYPE
Suction					Drain		
Discharge					Vent		
					Pressure Gage		
					Warm Up		
					Balance Line		

Casing Mount: <input type="checkbox"/> Foot <input type="checkbox"/> Bracket Centerline <input type="checkbox"/> Near Cntrl. <input type="checkbox"/> Inline Casing Split: <input type="checkbox"/> Axial <input type="checkbox"/> Radial Casing Type: <input type="checkbox"/> Diffuser <input type="checkbox"/> Staggered <input type="checkbox"/> Single Volute <input type="checkbox"/> Double Volute Max. Allowable Pressure (PSIG): At 60°F _____ At Nom. Pump Temp. _____ Hydro Test Pressure (PSIG): _____ Lubrication Type: <input type="checkbox"/> API 614 <input type="checkbox"/> Grease <input type="checkbox"/> Ring Oil <input type="checkbox"/> Oil Mist <input type="checkbox"/> Flood <input type="checkbox"/> Flinger <input type="checkbox"/> Pressure Remarks: _____	Impeller Diameter (Inches) Rated _____ Max. _____ Min. _____ Impeller Type: <input type="checkbox"/> Open <input type="checkbox"/> Closed Imp. Suction: <input type="checkbox"/> Single <input type="checkbox"/> Double Imp. Mount: <input type="checkbox"/> Btwn. Brgs <input type="checkbox"/> Overhung Rotation (Coupling End): <input type="checkbox"/> CW <input type="checkbox"/> CCW Bearing (Type/Number): Radial _____ Thrust _____ Coupling: Manufacturer _____ Type/Model _____ Driver Half-Coupling Mounted By: <input type="radio"/> Pump Mfr. <input type="radio"/> Driver Mfr. <input type="radio"/> Purchaser	Packing: Manufacturer _____ Type _____ Size/No. Rings _____ Mechanical Seal: API Class code _____ Manufacturer _____ Model _____ Mfr. Code _____ <input type="radio"/> Cartridge Type Required Gland Type/Mat'l.: _____ Gland Plate Taps Required for: <input type="radio"/> Quench <input type="radio"/> Flush <input type="radio"/> Drain <input type="radio"/> Vent
--	--	--

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○ = By Purchaser ☐ = By Mfr./Purchaser ○ Quench ○ Flush ○ Drain ○ Vent

ATTACHMENT A


FLUOR DANIEL
DATA SHEET

 U.S. Department of Energy
 Hanford Waste Vitrification Plant
 Richland, Washington
 DOE Contract DE-AC06-86RL10838

SEALLESS PUMPS

NO. △ △ △ △ △ △	BY DATE	REVISION	SHEET NO. P33B-DS-3	REV. 0
			DATE 03-15-90	CONTRACT 845734
			TAG NO. PX-520-004	
			SPECIFICATION SECT NO. 15148	
			ORIG BY HBJO	CHK'D SSL
			APPROD	

 ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: **H-2-123360-2 (SS 15148)**

ACID DRAIN CATCH TANK Service TRANSFER PUMP		No. Motor Driven 1 Pump Tag No. PX-520-004 ACID DRAIN CATCH TANK TRANSFER PUMP No. Stages _____ Motor Tag No. SAME Serial No. _____ Motor Provided By MANUFACTURER	PUMP MATERIALS Casing 304L S.S. Impeller 304L S.S. Internal Parts 304L S.S. No. Pumps Req 1 No. Turbine Driven N.A.
--	--	---	--

LIQUID Name WASTE WATER (ACID) Pumping Temperature (°F): Normal 70 Max. _____ Min. _____ Specific Gravity: @ 70 °F = 0.9980 Vapor Press. (PSIA): 0.36 Viscosity (CP): @ 70 °F = 0.98 Corrosion/Erosion Caused By: ACID Remarks: _____	OPERATING CONDITIONS Capacity (U.S. GPM): Normal 30 Rated 30 Discharge Pressure (PSIG): 51 Suction Pressure (PSIG): Max. _____ Rated 0.60 Differential Pressure (PSI): 50 Differential Head (Feet): 116 NPSH Available (Feet): 33 Hydraulic Power (HP): 0.9	SITE CONDITIONS Temp. (°F): Max. _____ Min. _____ Rel. Humid. (%): Max. _____ Min. _____ Altitude (Feet): _____ <input type="radio"/> Indoor <input type="radio"/> Heater <input type="radio"/> Roof <input type="radio"/> Outdoor <input type="radio"/> Unheater <input type="radio"/> Sun Area Classification: 3 Other: _____ Remarks: _____
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PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.: _____	Minimum Continuous Flow (GPM): _____	NPSH Required (Feet Water): _____
Speed (RPM): _____	Thermal _____ Stable _____	3% Head Drop _____
Efficiency (%): _____	Max. Head Rated Imp. (Feet): _____	Suction Specified Speed: _____
Rated Power (BHP): _____	Max. Power Rated Imp. (BHP): _____	

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONNECTIONS	SIZE	TYPE
Suction					Drain		
Discharge					Vent		
					Pressure Gage		
					Warm Up		
					Balance Line		

Casing Mount: <input type="checkbox"/> Foot <input type="checkbox"/> Bracket Centerline <input type="checkbox"/> Near Cntrl. <input type="checkbox"/> Inline Casing Split: <input type="checkbox"/> Axial <input type="checkbox"/> Radial Casing Type: <input type="checkbox"/> Diffuser <input type="checkbox"/> Staggered <input type="checkbox"/> Single Volute <input type="checkbox"/> Double Volute Max. Allowable Pressure (PSIG): At 60°F _____ At Nom. Pump Temp. _____ Hydro Test Pressure (PSIG): _____ Lubrication Type: <input type="checkbox"/> API 614 <input type="checkbox"/> Grease <input type="checkbox"/> Ring Oil <input type="checkbox"/> Oil Mist <input type="checkbox"/> Flood <input type="checkbox"/> Flinger <input type="checkbox"/> Pressure Remarks: _____	Impeller Diameter (Inches) Rated _____ Max. _____ Min. _____ Impeller Type: <input type="checkbox"/> Open <input type="checkbox"/> Closed Imp. Suction: <input type="checkbox"/> Single <input type="checkbox"/> Double Imp. Mount: <input type="checkbox"/> Btwn. Brgs <input type="checkbox"/> Overhung Rotation (Coupling End): <input type="checkbox"/> CW <input type="checkbox"/> CCW Bearing (Type/Number): Radial _____ Thrust _____ Coupling: Manufacturer _____ Type/Model _____ Driver Half-Coupling Mounted By: <input type="radio"/> Pump Mfr. <input type="radio"/> Driver Mfr. <input type="radio"/> Purchaser	Packing: Manufacturer _____ Type _____ Size/No. Rings _____ Mechanical Seal: API Class code _____ Manufacturer _____ Model _____ Mfr. Code _____ <input type="radio"/> Cartridge Type Required Gland Type/Mat'l.: _____ Gland Plate Taps Required for:
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☐ = By Purchaser ☐ = By Mfr./Purchaser ☐ Quench ☐ Flush ☐ Drain ☐ Vent

ATTACHMENT A


**FLUOR DANIEL
DATA SHEET**

 U.S. Department of Energy
 Hanford Waste Vitrification Plant
 Richland, Washington
 DOE Contract DE-AC06-86RL10838

SEALLESS PUMPS

NO. △ △ △ △ △ △	BY DATE	REVISION	SHEET NO. P33B-DS-4	REV. 0
			DATE 03-15-90	CONTRACT 845734
			TAG NO. PX-520-006	
			SPECIFICATION SECT NO. 15148	
			ORG BY HBJO	CHK'D SSL
			APPR'D	

 ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: **SS 15148**

ORGANIC ACID DRAIN CATCH TANK TRANSFER PUMP Service _____ Pump Mfr. _____ Size & Type _____ No. Stages _____ Serial No. _____	No. Motor Driven 1 Pump Tag No. PX-520-006 ORGANIC ACID DRAIN CATCH TANK TRANSFER PUMP Motor Tag No. SAME Motor Provided By MANUFACTURER	PUMP MATERIALS Casing 304L S.S. Impeller 304L S.S. Internal Parts 304L S.S. No. Pumps Req 1 No. Turbine Driven _____
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LIQUID Name WASTE WATER (ORG. ACID) Pumping Temperature (°F): Normal 70 Max. _____ Min. _____ Specific Gravity: @ 70 °F = 1.0 Vapor Press. (PSIA): 0.36 Viscosity (CP): @ 70 °F = 0.98 Corrosion/Erosion Caused By: ACID Remarks: _____	OPERATING CONDITIONS Capacity (U.S. GPM): Normal 30 Rated 30 Discharge Pressure (PSIG): 51.9 Suction Pressure (PSIG): Max. 2.6 Rated 0.60 Differential Pressure (PSI): 51.3 Differential Head (Feet): 118 NPSH Available (Feet): 30 Hydraulic Power (HP): 0.9	SITE CONDITIONS Temp. (°F): Max. _____ Min. _____ Rel. Humid. (%): Max. _____ Min. _____ Altitude (Feet): _____ <input type="radio"/> Indoor <input type="radio"/> Heater <input type="radio"/> Roof <input type="radio"/> Outdoor <input type="radio"/> Unheater <input type="radio"/> Sun Area Classification: 3 Other: _____ Remarks: _____
--	--	--

PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.: _____	Minimum Continuous Flow (GPM): _____	NPSH Required (Feet Water): _____
Speed (RPM): _____	Thermal _____ Stable _____	3% Head Drop _____
Efficiency (%): _____	Max. Head Rated Imp. (Feet): _____	Suction Specified Speed: _____
Rated Power (BHP): _____	Max. Power Rated Imp. (BHP): _____	

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONNECTIONS	SIZE	TYPE		
Suction					Drain				
Discharge					Vent				
Casing Mount: <input type="checkbox"/> Foot <input type="checkbox"/> Bracket Centerline <input type="checkbox"/> Near Cntrl. <input type="checkbox"/> Inline Casing Split: <input type="checkbox"/> Axial <input type="checkbox"/> Radial Casing Type: <input type="checkbox"/> Diffuser <input type="checkbox"/> Staggered <input type="checkbox"/> Single Volute <input type="checkbox"/> Double Volute Max. Allowable Pressure (PSIG): At 60°F _____ At Nom. Pump Temp. _____ Hydro Test Pressure (PSIG): _____ Lubrication Type: <input type="checkbox"/> API 614 <input type="checkbox"/> Grease <input type="checkbox"/> Ring Oil <input type="checkbox"/> Oil Mist <input type="checkbox"/> Flood <input type="checkbox"/> Flinger <input type="checkbox"/> Pressure Remarks: _____					Impeller Diameter (Inches) Rated _____ Max. _____ Min. _____ Impeller Type: <input type="checkbox"/> Open <input type="checkbox"/> Closed Imp. Suction: <input type="checkbox"/> Single <input type="checkbox"/> Double Imp. Mount: <input type="checkbox"/> Btwn. Brgs <input type="checkbox"/> Overhung Rotation (Coupling End): <input type="checkbox"/> CW <input type="checkbox"/> CCW Bearing (Type/Number): Radial _____ Thrust _____ Coupling: Manufacturer _____ Type/Model _____ Driver Half-Coupling Mounted By: <input type="radio"/> Pump Mfr. <input type="radio"/> Driver Mfr. <input type="radio"/> Purchaser			Packing: Manufacturer _____ Type _____ Size/No. Rings _____ Mechanical Seal: API Class code _____ Manufacturer _____ Model _____ Mfr. Code _____ <input type="radio"/> Cartridge Type Required Gland Type/Mat'l.: _____ Gland Plate Taps Required for:	

105/OS/101/207/84571881.MIS/WP51-01/26/93 10:07am

☐ = By Purchaser ☐ = By Mfr./Purchaser ☐ Quench ☐ Flush ☐ Drain ☐ Vent

P33B - 15148

9413202.0712

ATTACHMENT A


**FLUOR DANIEL
DATA SHEET**

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

SEALLESS PUMPS

NO.	BY	REVISION	SHEET NO.	REV.
	DATE		P33B-DS-5	0
			DATE	CONTRACT
			03-15-90	845734
			TAG NO.	PX-520-009
			SPECIFICATION SECT NO.	
			15148	
			ORIG BY	CHK'D
			HBAO	SSL
			APPR'D	

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: **SS 15148**

FLOOR DRAIN SAMPLING TANK TRANSFER PUMP Service _____ Pump Mfr. _____ Size & Type _____ No. Stages _____ Serial No. _____	No. Motor Driven 1 Pump Tag No. PX-520-009 FLOOR DRAIN SAMPLING TANK TRANSFER PUMP Motor Tag No. SAME Motor Provided By MANUFACTURER	PUMP MATERIALS Casing 304L S.S. Impeller 304L S.S. Internal Parts 304L S.S. No. Pumps Req 1 No. Turbine Driven _____
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LIQUID Name WASTE WATER Pumping Temperature (°F): Normal 70 Max. _____ Min. _____ Specific Gravity: @ 70 °F = 0.9980 Vapor Press. (PSIA): 0.36 Viscosity (CP): @ 70 °F = 0.98 Corrosion/Erosion Caused By: _____ Remarks: _____	OPERATING CONDITIONS Capacity (U.S. GPM): Normal 75 Rated 75 Discharge Pressure (PSIG): 62 Suction Pressure (PSIG): Max. _____ Rated 0.60 Differential Pressure (PSI): 62 Differential Head (Feet): 144 NPSH Available (Feet): 33 Hydraulic Power (HP): 2.7	SITE CONDITIONS Temp. (°F): Max. _____ Min. _____ Rel. Humid. (%): Max. _____ Min. _____ Altitude (Feet): _____ <input type="radio"/> Indoor <input type="radio"/> Heater <input type="radio"/> Roof <input type="radio"/> Outdoor <input type="radio"/> Unheater <input type="radio"/> Sun Area Classification: 3 Other: _____ Remarks: _____
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PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.: _____	Minimum Continuous Flow (GPM): _____	NPSH Required (Feet Water): _____
Speed (RPM): _____	Thermal _____ Stable _____	3% Head Drop _____
Efficiency (%): _____	Max. Head Rated Imp. (Feet): _____	Suction Specified Speed: _____
Rated Power (BHP): _____	Max. Power Rated Imp. (BHP): _____	

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONNECTIONS	SIZE	TYPE
Suction					Drain		
Discharge					Vent		
					Pressure Gage		
					Warm Up		
					Balance Line		

Casing Mount: <input type="checkbox"/> Foot <input type="checkbox"/> Bracket Centerline <input type="checkbox"/> Near Cntrl. <input type="checkbox"/> Inline Casing Split: <input type="checkbox"/> Axial <input type="checkbox"/> Radial Casing Type: <input type="checkbox"/> Diffuser <input type="checkbox"/> Staggered <input type="checkbox"/> Single Volute <input type="checkbox"/> Double Volute Max. Allowable Pressure (PSIG): At 60°F _____ At Nom. Pump Temp. _____ Hydro Test Pressure (PSIG): _____ Lubrication Type: <input type="checkbox"/> API 614 <input type="checkbox"/> Grease <input type="checkbox"/> Ring Oil <input type="checkbox"/> Oil Mist <input type="checkbox"/> Flood <input type="checkbox"/> Flinger <input type="checkbox"/> Pressure Remarks: _____	Impeller Diameter (Inches) Rated _____ Max. _____ Min. _____ Impeller Type: <input type="checkbox"/> Open <input type="checkbox"/> Closed Imp. Suction: <input type="checkbox"/> Single <input type="checkbox"/> Double Imp. Mount: <input type="checkbox"/> Btwn. Brgs <input type="checkbox"/> Overhung Rotation (Coupling End): <input type="checkbox"/> CW <input type="checkbox"/> CCW Bearing (Type/Number): Radial _____ Thrust _____ Coupling: Manufacturer _____ Type/Model _____ Driver Half-Coupling Mounted By: <input type="radio"/> Pump Mfr. <input type="radio"/> Driver Mfr. <input type="radio"/> Purchaser	Packing: Manufacturer _____ Type _____ Size/No. Rings _____ Mechanical Seal: API Class code _____ Manufacturer _____ Model _____ Mfr. Code _____ <input type="radio"/> Cartridge Type Required Gland Type/Mat'l.: _____ Gland Plate Taps Required for:
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10510S1101207184571883.MIS/WP51-01/26/93 10:16am

☐ = By Purchaser ☐ = By Mfr./Purchaser ☐ Quench ☐ Flush ☐ Drain ☐ Vent

P33B - 15148

ATTACHMENT A


**FLUOR DANIEL
DATA SHEET**

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

SEALLESS PUMPS

NO.	BY	REVISION	SHEET NO.	REV.
	DATE		P33B-DS-6	0
			DATE	CONTRACT
			03-23-89	845734
			TAG NO.	PX-540-002
			SPECIFICATION SECT NO.	15148
	ORIG BY	CHK'D	APPR'D	
	J. Janzen	SSL		

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: H-2-123362-8 (SS 15148)

Service <u>SUGAR SOLUTION FEED PUMP</u>	No. Motor Driven <u>1</u>	PUMP MATERIALS Casing <u>304L/316L S.S.</u> Impeller <u>304L/316L S.S.</u> Internal Parts <u>304L/316L S.S.</u> No. Pumps Req <u>1</u> No. Turbine Driven _____
Pump Mfr. _____	Pump Tag No. <u>PX-540-002</u>	
Size & Type _____	<u>SUGAR SOLUTION FEED PUMP</u>	
No. Stages _____	Motor Tag No. <u>SAME</u>	
Serial No. _____	Motor Provided By <u>MANUFACTURER</u>	

LIQUID Name <u>SUCROSE (75% BY WEIGHT)</u> Pumping Temperature (°F): Normal <u>100</u> Max. <u>100</u> Min. _____ Specific Gravity: @ <u>100</u> °F = <u>1.383</u> Vapor Press. (PSIA): <u>0.95</u> Viscosity (CP): @ <u>100</u> °F = <u>608</u> Corrosion/Erosion Caused By: _____ Remarks: _____	OPERATING CONDITIONS Capacity (U.S. GPM): Normal <u>1</u> Rated <u>1.38</u> Discharge Pressure (PSIG): <u>38.9</u> Suction Pressure (PSIG): Max. _____ Rated <u>0.9</u> Differential Pressure (PSI): <u>38</u> Differential Head (Feet): <u>63.4</u> NPSH Available (Feet): <u>23.6</u> Hydraulic Power (HP): <u>0.018</u>	SITE CONDITIONS Temp. (°F): Max. _____ Min. _____ Rel. Humid. (%): Max. _____ Min. _____ Altitude (Feet): _____ <input type="radio"/> Indoor <input type="radio"/> Heater <input type="radio"/> Roof <input type="radio"/> Outdoor <input type="radio"/> Unheater <input type="radio"/> Sun Area Classification: <u>3</u> Other: _____ Remarks: _____
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PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.: _____	Minimum Continuous Flow (GPM): _____	NPSH Required (Feet Water): _____
Speed (RPM): _____	Thermal _____ Stable _____	3% Head Drop _____
Efficiency (%): _____	Max. Head Rated Imp. (Feet): _____	Suction Specified Speed: _____
Rated Power (BHP): _____	Max. Power Rated Imp. (BHP): _____	

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONNECTIONS	SIZE	TYPE
Suction					Drain		
Discharge					Vent		
					Pressure Gage		
					Warm Up		
					Balance Line		

Casing Mount: <input type="checkbox"/> Foot <input type="checkbox"/> Bracket Centerline <input type="checkbox"/> Near Cntrl. <input type="checkbox"/> Inline Casing Split: <input type="checkbox"/> Axial <input type="checkbox"/> Radial Casing Type: <input type="checkbox"/> Diffuser <input type="checkbox"/> Staggered <input type="checkbox"/> Single Volute <input type="checkbox"/> Double Volute Max. Allowable Pressure (PSIG): At 60°F _____ At Nom. Pump Temp. _____ Hydro Test Pressure (PSIG): _____ Lubrication Type: <input type="checkbox"/> API 614 <input type="checkbox"/> Grease <input type="checkbox"/> Ring Oil <input type="checkbox"/> Oil Mist <input type="checkbox"/> Flood <input type="checkbox"/> Flinger <input type="checkbox"/> Pressure Remarks: _____	Impeller Diameter (Inches) Rated _____ Max. _____ Min. _____ Impeller Type: <input type="checkbox"/> Open <input type="checkbox"/> Closed Imp. Suction: <input type="checkbox"/> Single <input type="checkbox"/> Double Imp. Mount: <input type="checkbox"/> Btwn. Brgs <input type="checkbox"/> Overhung Rotation (Coupling End): <input type="checkbox"/> CW <input type="checkbox"/> CCW Bearing (Type/Number): Radial _____ Thrust _____ Coupling: Manufacturer _____ Type/Model _____ Driver Half-Coupling Mounted By: <input type="radio"/> Pump Mfr. <input type="radio"/> Driver Mfr. <input type="radio"/> Purchaser	Packing: Manufacturer _____ Type _____ Size/No. Rings _____ Mechanical Seal: API Class code _____ Manufacturer _____ Model _____ Mfr. Code _____ <input type="radio"/> Cartridge Type Required Gland Type/Mat'l.: _____ Gland Plate Taps Required for: _____
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105/OS/101/207/84571884.MIS/WP51-01/26/93 1:42pm

☐ = By Purchaser ☐ = By Mfr./Purchaser ☐ Quench ☐ Flush ☐ Drain ☐ Vent

P33B - 15148

9413202-0714

ATTACHMENT A


FLUOR DANIEL
DATA SHEET

 U.S. Department of Energy
 Hanford Waste Vitrification Plant
 Richland, Washington
 DOE Contract DE-AC06-86RL10838

SEALLESS PUMPS

NO.	BY	REVISION	SHEET NO.	REV
	DATE		P33B-DS-7	0
			DATE	CONTRACT
			04-06-89	845734
			TAG NO.	PX-540-004
			SPECIFICATION SECT NO.	15148
	ORIG BY	CHK'D	APPR'D	
	J. Janzen	SSL		

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: H-2-123362-9 (SS 15148)

OFF-GAS TREATMENT CHEMICAL FEED PUMP Service _____ Pump Mfr. _____ Size & Type _____ No. Stages _____ Serial No. _____	No. Motor Driven <u>1</u> Pump Tag No. <u>PX-540-004</u> OFF-GAS TREATMENT CHEMICAL FEED PUMP Motor Tag No. <u>SAME</u> Motor Provided By <u>MANUFACTURER</u>	PUMP MATERIALS Casing <u>316L S.S.</u> Impeller <u>316L S.S.</u> Internal Parts <u>316L S.S.</u> No. Pumps Req <u>1</u> No. Turbine Driven _____
--	--	--

LIQUID Name <u>TRD</u> Pumping Temperature (°F): Normal <u>77</u> Max. <u>77</u> Min. _____ Specific Gravity: @ <u>77</u> °F = <u>0.997</u> Vapor Press. (PSIA): <u>0.46</u> Viscosity (CP): @ <u>77</u> °F = <u>0.877</u> Corrosion/Erosion Caused By: _____ Remarks: _____	OPERATING CONDITIONS Capacity (U.S. GPM): Normal <u>5</u> Rated <u>6.88</u> Discharge Pressure (PSIG): <u>11.4</u> Suction Pressure (PSIG): Max. _____ Rated <u>0.8</u> Differential Pressure (PSI): <u>10.6</u> Differential Head (Feet): <u>24.5</u> NPSH Available (Feet): <u>33.7</u> Hydraulic Power (HP): <u>0.043</u>	SITE CONDITIONS Temp. (°F): Max. _____ Min. _____ Rel. Humid. (%): Max. _____ Min. _____ Altitude (Feet): _____ <input type="radio"/> Indoor <input type="radio"/> Heater <input type="radio"/> Roof <input type="radio"/> Outdoor <input type="radio"/> Unheater <input type="radio"/> Sun Area Classification: <u>3</u> Other: _____ Remarks: _____
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PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.: _____	Minimum Continuous Flow (GPM): _____	NPSH Required (Feet Water): _____
Speed (RPM): _____	Thermal _____ Stable _____	3% Head Drop _____
Efficiency (%): _____	Max. Head Rated Imp. (Feet): _____	Suction Specified Speed: _____
Rated Power (BHP): _____	Max. Power Rated Imp. (BHP): _____	

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONNECTIONS	SIZE	TYPE
Suction					Drain		
Discharge					Vent		
					Pressure Gage		
					Warm Up		
					Balance Line		

Casing Mount: <input type="checkbox"/> Foot <input type="checkbox"/> Bracket <input type="checkbox"/> Centerline <input type="checkbox"/> Near Cntrl. <input type="checkbox"/> Inline Casing Split: <input type="checkbox"/> Axial <input type="checkbox"/> Radial Casing Type: <input type="checkbox"/> Diffuser <input type="checkbox"/> Staggered <input type="checkbox"/> Single Volute <input type="checkbox"/> Double Volute Max. Allowable Pressure (PSIG): At 60°F _____ At Nom. Pump Temp. _____ Hydro Test Pressure (PSIG): _____ Lubrication Type: <input type="checkbox"/> API 614 <input type="checkbox"/> Grease <input type="checkbox"/> Ring Oil <input type="checkbox"/> Oil Mist <input type="checkbox"/> Flood <input type="checkbox"/> Flinger <input type="checkbox"/> Pressure Remarks: _____	Impeller Diameter (Inches) Rated _____ Max. _____ Min. _____ Impeller Type: <input type="checkbox"/> Open <input type="checkbox"/> Closed Imp. Suction: <input type="checkbox"/> Single <input type="checkbox"/> Double Imp. Mount: <input type="checkbox"/> Btwn. Brgs <input type="checkbox"/> Overhung Rotation (Coupling End): <input type="checkbox"/> CW <input type="checkbox"/> CCW Bearing (Type/Number): Radial _____ Thrust _____ Coupling: Manufacturer _____ Type/Model _____ Driver Half-Coupling Mounted By: <input type="radio"/> Pump Mfr. <input type="radio"/> Driver Mfr. <input type="radio"/> Purchaser	Packing: Manufacturer _____ Type _____ Size/No. Rings _____ Mechanical Seal: API Class code _____ Manufacturer _____ Model _____ Mfr. Code _____ <input type="radio"/> Cartridge Type Required Gland Type/Mat'l.: _____ Gland Plate Taps Required for: _____
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105\OS\101\207\84571887.MIS\WP51-01\26\83 11:19am

☐ = By Purchaser ☐ = By Mfr./Purchaser ☐ Quench ☐ Flush ☐ Drain ☐ Vent

P33B - 15148

9413202.0715

ATTACHMENT A


FLUOR DANIEL
DATA SHEET

 U.S. Department of Energy
 Hanford Waste Vitrification Plant
 Richland, Washington
 DOE Contract DE-AC06-86RL10838

SEALLESS PUMPS

NO. △ △ △ △ △ △	BY DATE	REVISION	SHEET NO. P33B-DS-8	REV. 0
			DATE 03-23-89	CONTRACT 845734
			TAG NO. PX-540-006	
			SPECIFICATION SECT NO. 15148	
			ORIG BY J. Janzen	CHK'D SSL
			APPR'D	

 ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: **H-2-123362-10 (SS 15148)**

POTASSIUM HYDROXIDE/ FRIT MODIFIER FEED PUMP Service _____ Pump Mfr. _____ Size & Type _____ No. Stages _____ Serial No. _____	No. Motor Driven 1 Pump Tag No. PX-540-006 POTASSIUM HYDROXIDE/FRIT MODIFIER FEED PUMP Motor Tag No. SAME Motor Provided By MANUFACTURER	PUMP MATERIALS Casing 316L S.S. Impeller 316L S.S. Internal Parts 316L S.S. No. Pumps Req 1 No. Turbine Driven _____
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LIQUID Name POTASSIUM HYDROXIDE (51.7% BY WEIGHT) Pumping Temperature (°F): Normal 77 Max. 100 Min. _____ Specific Gravity: @ 77 °F = 1.528 Vapor Press. (PSIA): 0.46 Viscosity (CP): @ 77 °F = 8.581 Corrosion/Erosion Caused By: _____ Remarks: _____	OPERATING CONDITIONS Capacity (U.S. GPM): Normal 5 Rated 6.88 Discharge Pressure (PSIG): 37.2 Suction Pressure (PSIG): Max. _____ Rated 1.2 Differential Pressure (PSI): 36 Differential Head (Feet): 54.4 NPSH Available (Feet): 22.9 Hydraulic Power (HP): 0.145	SITE CONDITIONS Temp. (°F): Max. _____ Min. _____ Rel. Humid. (%): Max. _____ Min. _____ Altitude (Feet): _____ <input type="radio"/> Indoor <input type="radio"/> Heater <input type="radio"/> Roof <input type="radio"/> Outdoor <input type="radio"/> Unheater <input type="radio"/> Sun Area Classification: 3 Other: _____ Remarks: _____
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PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.: _____	Minimum Continuous Flow (GPM): _____	NPSH Required (Feet Water): _____
Speed (RPM): _____	Thermal _____ Stable _____	3% Head Drop _____
Efficiency (%): _____	Max. Head Rated Imp. (Feet): _____	Suction Specified Speed: _____
Rated Power (BHP): _____	Max. Power Rated Imp. (BHP): _____	

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONNECTIONS	SIZE	TYPE
Suction					Drain		
Discharge					Vent		
					Pressure Gage		
					Warm Up		
					Balance Line		

Casing Mount: <input type="checkbox"/> Foot <input type="checkbox"/> Bracket Centerline <input type="checkbox"/> Near Cntrl. <input type="checkbox"/> Inline Casing Split: <input type="checkbox"/> Axial <input type="checkbox"/> Radial Casing Type: <input type="checkbox"/> Diffuser <input type="checkbox"/> Staggered <input type="checkbox"/> Single Volute <input type="checkbox"/> Double Volute Max. Allowable Pressure (PSIG): At 60°F _____ At Nom. Pump Temp. _____ Hydro Test Pressure (PSIG): _____ Lubrication Type: <input type="checkbox"/> API 614 <input type="checkbox"/> Grease <input type="checkbox"/> Ring Oil <input type="checkbox"/> Oil Mist <input type="checkbox"/> Flood <input type="checkbox"/> Flinger <input type="checkbox"/> Pressure Remarks: _____	Impeller Diameter (Inches) Rated _____ Max. _____ Min. _____ Impeller Type: <input type="checkbox"/> Open <input type="checkbox"/> Closed Imp. Suction: <input type="checkbox"/> Single <input type="checkbox"/> Double Imp. Mount: <input type="checkbox"/> Btwn. Brgs <input type="checkbox"/> Overhung Rotation (Coupling End): <input type="checkbox"/> CW <input type="checkbox"/> CCW Bearing (Type/Number): Radial _____ Thrust _____ Coupling: Manufacturer _____ Type/Model _____ Driver Half-Coupling Mounted By: <input type="radio"/> Pump Mfr. <input type="radio"/> Driver Mfr. <input type="radio"/> Purchaser	Packing: Manufacturer _____ Type _____ Size/No. Rings _____ Mechanical Seal: API Class code _____ Manufacturer _____ Model _____ Mfr. Code _____ <input type="radio"/> Cartridge Type Required Gland Type/Mat'l.: _____ Gland Plate Taps Required for:
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105\OS\101\207\84571891.MIS\WP51-01/26/93 11:25am

☐ = By Purchaser ☐ = By Mfr./Purchaser ☐ Quench ☐ Flush ☐ Drain ☐ Vent

P33B - 15148

9413202.0716

ATTACHMENT A


FLUOR DANIEL
DATA SHEET

 U.S. Department of Energy
 Hanford Waste Vitrification Plant
 Richland, Washington
 DOE Contract DE-AC06-86RL10838

SEALLESS PUMPS

NO.	BY	REVISION	SHEET NO.	REV
1	DATE		P33B-DS-9	0
2	SSL		DATE	CONTRACT
3	12-05-91		06-30-89	845734
4			TAG NO.	PX-540-009
5			SPECIFICATION SECT NO.	15148
6			ORIG BY	CHK'D
7			J. Janzen	SSL
8			APPR'D	

 ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: **H-2-123362-14 (SS 15148)**

Service FORMIC ACID FEED PUMP	No. Motor Driven 1	PUMP MATERIALS
Pump Mfr. _____	Pump Tag No. PX-540-009	Casing 316L S.S.
Size & Type _____	FORMIC ACID FEED PUMP	Impeller 316L S.S.
No. Stages _____	Motor Tag No. SAME	Internal Parts 316L S.S.
Serial No. _____	Motor Provided By MANUFACTURER	No. Pumps Req 1
		No. Turbine Driven _____

LIQUID	OPERATING CONDITIONS	SITE CONDITIONS
Name FORMIC ACID (90% BY WEIGHT)	Capacity (U.S. GPM): Normal 0.4 Rated 4.4	Temp. (°F): Max. _____ Min. _____
Pumping Temperature (°F): Normal 77 Max. 77 Min. _____	Discharge Pressure (PSIG): 12.8	Rel. Humid. (%): Max. _____ Min. _____
Specific Gravity: @ 77 °F = 1.201	Suction Pressure (PSIG): Max. _____ Rated 0.8	Altitude (Feet): _____
Vapor Press. (PSIA): 1.06	Differential Pressure (PSI): 12	<input type="radio"/> Indoor <input type="radio"/> Heater <input type="radio"/> Roof
Viscosity (CP): @ 77 °F = 1.8	Differential Head (Feet): 23.2	<input type="radio"/> Outdoor <input type="radio"/> Unheater <input type="radio"/> Sun
Corrosion/Erosion Caused By: _____	NPSH Available (Feet): 27	Area Classification: 3
Remarks: _____	Hydraulic Power (HP): 0.03	Other: _____
		Remarks: 1" SCHEDULE 160 TYPE 316L
		USED FOR THE TRANSFER LINE

PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.: _____	Minimum Continuous Flow (GPM): _____	NPSH Required (Feet Water): _____
Speed (RPM): _____	Thermal _____ Stable _____	3% Head Drop _____
Efficiency (%): _____	Max. Head Rated Imp. (Feet): _____	Suction Specified Speed: _____
Rated Power (BHP): _____	Max. Power Rated Imp. (BHP): _____	

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONNECTIONS	SIZE	TYPE
Suction					Drain		
Discharge					Vent		
Casing Mount: <input type="checkbox"/> Foot <input type="checkbox"/> Bracket			Impeller Diameter (Inches)		Pressure Gage		
Centerline <input type="checkbox"/> Near Cntrl. <input type="checkbox"/> Inline			Rated _____ Max. _____ Min. _____		Warm Up		
Casing Split: <input type="checkbox"/> Axial <input type="checkbox"/> Radial			Impeller Type: <input type="checkbox"/> Open <input type="checkbox"/> Closed		Balance Line		
Casing Type: <input type="checkbox"/> Diffuser <input type="checkbox"/> Staggered			Imp. Suction: <input type="checkbox"/> Single <input type="checkbox"/> Double		Packing:		
<input type="checkbox"/> Single Volute <input type="checkbox"/> Double Volute			Imp. Mount: <input type="checkbox"/> Btwn. Brgs <input type="checkbox"/> Overhung		Manufacturer _____		
Max. Allowable Pressure (PSIG):			Rotation (Coupling End): <input type="checkbox"/> CW <input type="checkbox"/> CCW		Type _____		
At 60°F _____			Bearing (Type/Number):		Size/No. Rings _____		
At Nom. Pump Temp. _____			Radial _____		Mechanical Seal:		
Hydro Test Pressure (PSIG): _____			Thrust _____		API Class code _____		
Lubrication Type: <input type="checkbox"/> API 614			Coupling:		Manufacturer _____		
<input type="checkbox"/> Grease <input type="checkbox"/> Ring Oil <input type="checkbox"/> Oil Mist			Manufacturer _____		Model _____		
<input type="checkbox"/> Flood <input type="checkbox"/> Flinger <input type="checkbox"/> Pressure			Type/Model _____		Mfr. Code _____		
Remarks: _____			Driver Half-Coupling Mounted By:		<input type="radio"/> Cartridge Type Required		
			<input type="radio"/> Pump Mfr. <input type="radio"/> Driver Mfr. <input type="radio"/> Purchaser		Gland Type/Mat'l.: _____		
					Gland Plate Taps Required for:		

105/OS/101/207/84571892.MIS/WP51-01/26/93 1:44pm

☐ = By Purchaser ☐ = By Mfr./Purchaser ☐ Quench ☐ Flush ☐ Drain ☐ Vent

P33B - 15148

9413202.0717

**FLUOR DANIEL****DATA SHEET**U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838**SEALLESS PUMPS**

NO.	REVISION	SHEET NO.	REV
△		P33B-DS-10	0
△		DATE	CONTRACT
△		04-05-89	845734
△		TAG NO.	
△		PX-540-015	
△		SPECIFICATION SECT NO.	
△		15148	
△		DRG BY	CHK'D
△		J. Janzen	SSL
△		APPR'D	

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: H-2-123362-18 (SS 15148)

NITRIC ACID (50%) FEED PUMP	No. Motor Driven <u>1</u>	PUMP MATERIALS
Service _____	Pump Tag No. <u>PX-540-015</u>	Casing <u>304L/316L</u>
Pump Mfr. _____	<u>NITRIC ACID (50%)</u>	Impeller <u>304L/316L</u>
Size & Type _____	<u>FEED PUMP</u>	Internal Parts <u>304L/316L</u>
No. Stages _____	Motor Tag No. <u>SAME</u>	No. Pumps Req <u>1</u>
Serial No. _____	Motor Provided By <u>MANUFACTURER</u>	No. Turbine Driven _____

LIQUID	OPERATING CONDITIONS	SITE CONDITIONS
Name <u>NITRIC ACID (50% BY WEIGHT)</u>	Capacity (U.S. GPM): Normal <u>10</u> Rated <u>13.75</u>	Temp. (°F): Max. _____ Min. _____
Pumping Temperature (°F): Normal <u>77</u> Max. <u>77</u> Min. _____	Discharge Pressure (PSIG): <u>15.9</u>	Rel. Humid. (%): Max. _____ Min. _____
Specific Gravity: @ <u>77</u> °F = <u>1.304</u>	Suction Pressure (PSIG): Max. _____ Rated <u>1.0</u>	Altitude (Feet): _____
Vapor Press. (PSIA): <u>0.30</u>	Differential Pressure (PSI): <u>14.9</u>	<input type="radio"/> Indoor <input type="radio"/> Heater <input type="radio"/> Roof
Viscosity (CP): @ <u>77</u> °F = <u>1.75</u>	Differential Head (Feet): <u>26.4</u>	<input type="radio"/> Outdoor <input type="radio"/> Unheater <input type="radio"/> Sun
Corrosion/Erosion Caused By: _____	NPSH Available (Feet): <u>26.5</u>	Area Classification: <u>3</u>
Remarks: _____	Hydraulic Power (HP): <u>0.12</u>	Other: _____
		Remarks: _____

PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.: _____	Minimum Continuous Flow (GPM): _____	NPSH Required (Feet Water): _____
Speed (RPM): _____	Thermal _____ Stable _____	3% Head Drop _____
Efficiency (%): _____	Max. Head Rated Imp. (Feet): _____	Suction Specified Speed: _____
Rated Power (BHP): _____	Max. Power Rated Imp. (BHP): _____	

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONNECTIONS	SIZE	TYPE
Suction					Drain		
Discharge					Vent		
					Pressure Gage		
					Warm Up		
					Balance Line		

Casing Mount: <input type="checkbox"/> Foot <input type="checkbox"/> Bracket	Impeller Diameter (Inches) Rated _____ Max. _____ Min. _____
Centerline <input type="checkbox"/> Near Cntrl. <input type="checkbox"/> Inline	Impeller Type: <input type="checkbox"/> Open <input type="checkbox"/> Closed
Casing Split: <input type="checkbox"/> Axial <input type="checkbox"/> Radial	Imp. Suction: <input type="checkbox"/> Single <input type="checkbox"/> Double
Casing Type: <input type="checkbox"/> Diffuser <input type="checkbox"/> Staggered	Imp. Mount: <input type="checkbox"/> Btwn. Brgs <input type="checkbox"/> Overhung
<input type="checkbox"/> Single Volute <input type="checkbox"/> Double Volute	Rotation (Coupling End): <input type="checkbox"/> CW <input type="checkbox"/> CCW
Max. Allowable Pressure (PSIG): At 60°F _____	Bearing (Type/Number): Radial _____
At Nom. Pump Temp. _____	Thrust _____
Hydro Test Pressure (PSIG): _____	Coupling: Manufacturer _____
Lubrication Type: <input type="checkbox"/> API 614	Type/Model _____
<input type="checkbox"/> Grease <input type="checkbox"/> Ring Oil <input type="checkbox"/> Oil Mist	Driver Half-Coupling Mounted By: <input type="radio"/> Pump Mfr. <input type="radio"/> Driver Mfr. <input type="radio"/> Purchaser
<input type="checkbox"/> Flood <input type="checkbox"/> Flinger <input type="checkbox"/> Pressure	
Remarks: _____	

Manufacturer _____	Type _____
Size/No. Rings _____	Mechanical Seal: API Class code _____
Manufacturer _____	Model _____
Mr. Code _____	<input type="radio"/> Cartridge Type Required
	Gland Type/Mat'l.: _____
	Gland Plate Taps Required for: <input type="radio"/> Quench <input type="radio"/> Flush <input type="radio"/> Drain <input type="radio"/> Vent

ATTACHMENT A


**FLUOR DANIEL
DATA SHEET**

 U.S. Department of Energy
 Hanford Waste Vitrification Plant
 Richland, Washington
 DOE Contract DE-AC06-86RL10838

SEALLESS PUMPS

NO. △ △ △ △ △ △	BY DATE	REVISION	SHEET NO. P33B-DS-11	REV. 0
			DATE 04-03-89	CONTRACT 845734
			TAG NO. PX-540-018	
			SPECIFICATION SECT NO. 15148	
			ORIG BY J. Janzen	CHK'D SSL
			APPR'D	

 ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: **H-2-123362-19 (SS 15148)**

NITRIC ACID Service DECON FEED PUMP Pump Mfr. _____ Size & Type _____ No. Stages _____ Serial No. _____	No. Motor Driven 1 Pump Tag No. PX-540-018 NITRIC ACID DECON FEED PUMP Motor Tag No. SAME Motor Provided By MANUFACTURER	PUMP MATERIALS Casing 304L/316L S.S. Impeller 304L/316L S.S. Internal Parts 304L/316L S.S. No. Pumps Req 1 No. Turbine Driven _____
--	---	---

LIQUID Name NITRIC ACID (12% Wt) POTASSIUM PERMANGANATE (0.75% Wt) Pumping Temperature (°F): Normal 77 Max. _____ Min. _____ Specific Gravity: @ 77 °F = 1.064 Vapor Press. (PSIA): 0.46 Viscosity (CP): @ 77 °F = 0.95 Corrosion/Erosion Caused By: _____ Remarks: _____	OPERATING CONDITIONS Capacity (U.S. GPM): Normal 30 Rated 41.25 Discharge Pressure (PSIG): 232.2 Suction Pressure (PSIG): Max. _____ Rated 4.7 Differential Pressure (PSI): 227.5 Differential Head (Feet): 483.0 NPSH Available (Feet): 40.3 Hydraulic Power (HP): 5.471	SITE CONDITIONS Temp. (°F): Max. _____ Min. _____ Rel. Humid. (%): Max. _____ Min. _____ Altitude (Feet): _____ <input type="radio"/> Indoor <input type="radio"/> Heater <input type="radio"/> Roof <input type="radio"/> Outdoor <input type="radio"/> Unheater <input type="radio"/> Sun Area Classification: 3 Other: _____ Remarks: _____
---	---	--

PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.: _____	Minimum Continuous Flow (GPM): _____	NPSH Required (Feet Water): _____
Speed (RPM): _____	Thermal _____ Stable _____	3% Head Drop _____
Efficiency (%): _____	Max. Head Rated Imp. (Feet): _____	Suction Specified Speed: _____
Rated Power (BHP): _____	Max. Power Rated Imp. (BHP): _____	

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONNECTIONS	SIZE	TYPE
Suction					Drain		
Discharge					Vent		
					Pressure Gage		
					Warm Up		
					Balance Line		

Casing Mount: <input type="checkbox"/> Foot <input type="checkbox"/> Bracket Centerline <input type="checkbox"/> Near Cntrl. <input type="checkbox"/> Inline Casing Split: <input type="checkbox"/> Axial <input type="checkbox"/> Radial Casing Type: <input type="checkbox"/> Diffuser <input type="checkbox"/> Staggered <input type="checkbox"/> Single Volute <input type="checkbox"/> Double Volute Max. Allowable Pressure (PSIG): At 60°F _____ At Nom. Pump Temp. _____ Hydro Test Pressure (PSIG): _____ Lubrication Type: <input type="checkbox"/> API 614 <input type="checkbox"/> Grease <input type="checkbox"/> Ring Oil <input type="checkbox"/> Oil Mist <input type="checkbox"/> Flood <input type="checkbox"/> Flinger <input type="checkbox"/> Pressure Remarks: _____	Impeller Diameter (Inches) Rated _____ Max. _____ Min. _____ Impeller Type: <input type="checkbox"/> Open <input type="checkbox"/> Closed Imp. Suction: <input type="checkbox"/> Single <input type="checkbox"/> Double Imp. Mount: <input type="checkbox"/> Btwn. Brgs <input type="checkbox"/> Overhung Rotation (Coupling End): <input type="checkbox"/> CW <input type="checkbox"/> CCW Bearing (Type/Number): Radial _____ Thrust _____ Coupling: Manufacturer _____ Type/Model _____ Driver Half-Coupling Mounted By: <input type="radio"/> Pump Mfr. <input type="radio"/> Driver Mfr. <input type="radio"/> Purchaser	Packing: Manufacturer _____ Type _____ Size/No. Rings _____ Mechanical Seal: API Class code _____ Manufacturer _____ Model _____ Mfr. Code _____ <input type="radio"/> Cartridge Type Required Gland Type/Mat'l.: _____ Gland Plate Taps Required for:
--	--	---

105/OS/101/204/84571894.001/WP51-01/26/93 11:33am

☐ = By Purchaser ☐ = By Mfr./Purchaser ☐ Quench ☐ Flush ☐ Drain ☐ Vent

P33B - 15148

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ATTACHMENT A


**FLUOR DANIEL
DATA SHEET**

 U.S. Department of Energy
 Hanford Waste Vitrification Plant
 Richland, Washington
 DOE Contract DE-AC06-86RL10838

SEALLESS PUMPS

NO. △ △ △ △ △ △	BY DATE	REVISION	SHEET NO. P33B-DS-12	REV 0
			DATE 03-22-89	CONTRACT 845734
			TAG NO. PX-540-021	
			SPECIFICATION SECT NO. 15148	
			ORIG BY J. Janzen	CHK'D SSL
			APPR'D	

 ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: **H-2-123362-18 (SS 15148)**

OXALIC ACID Service DECONTAMINATION FEED PUMP Pump Mfr. _____ Size & Type _____ No. Stages _____ Serial No. _____	No. Motor Driven 1 Pump Tag No. PX-540-021 OXALIC ACID DECONTAMINATION FEED PUMP Motor Tag No. SAME Motor Provided By MANUFACTURER	PUMP MATERIALS Casing 316L S.S. Impeller 316L S.S. Internal Parts 316L S.S. No. Pumps Req 1 No. Turbine Driven _____
--	---	--

LIQUID Name OXALIC ACID (10% BY WEIGHT) Pumping Temperature (°F): Normal 77 Max. 150 Min. _____ Specific Gravity: @ 77 °F = 1.033 Vapor Press. (PSIA): 0.46 Viscosity (CP): @ 77 °F = 1.09 Corrosion/Erosion Caused By: _____ Remarks: _____	OPERATING CONDITIONS Capacity (U.S. GPM): Normal 30 Rated 41.25 Discharge Pressure (PSIG): 231.7 Suction Pressure (PSIG): Max. _____ Rated 4.6 Differential Pressure (PSI): 227.1 Differential Head (Feet): 506.8 NPSH Available (Feet): 41.2 Hydraulic Power (HP): 5.462	SITE CONDITIONS Temp. (°F): Max. _____ Min. _____ Rel. Humid. (%): Max. _____ Min. _____ Altitude (Feet): _____ <input type="radio"/> Indoor <input type="radio"/> Heater <input type="radio"/> Roof <input type="radio"/> Outdoor <input type="radio"/> Unheater <input type="radio"/> Sun Area Classification: 3 Other: _____ Remarks: _____
---	---	--

PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.: _____	Minimum Continuous Flow (GPM): _____	NPSH Required (Feet Water): _____
Speed (RPM): _____	Thermal _____ Stable _____	3% Head Drop _____
Efficiency (%): _____	Max. Head Rated Imp. (Feet): _____	Suction Specified Speed: _____
Rated Power (BHP): _____	Max. Power Rated Imp. (BHP): _____	

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONNECTIONS	SIZE	TYPE
Suction					Drain		
Discharge					Vent		
					Pressure Gage		
					Warm Up		
					Balance Line		

Casing Mount: <input type="checkbox"/> Foot <input type="checkbox"/> Bracket Centerline <input type="checkbox"/> Near Cntrl. <input type="checkbox"/> Inline Casing Split: <input type="checkbox"/> Axial <input type="checkbox"/> Radial Casing Type: <input type="checkbox"/> Diffuser <input type="checkbox"/> Staggered <input type="checkbox"/> Single Volute <input type="checkbox"/> Double Volute Max. Allowable Pressure (PSIG): At 60°F _____ At Nom. Pump Temp. _____ Hydro Test Pressure (PSIG): _____ Lubrication Type: <input type="checkbox"/> API 614 <input type="checkbox"/> Grease <input type="checkbox"/> Ring Oil <input type="checkbox"/> Oil Mist <input type="checkbox"/> Flood <input type="checkbox"/> Flinger <input type="checkbox"/> Pressure Remarks: _____	Impeller Diameter (Inches) Rated _____ Max. _____ Min. _____ Impeller Type: <input type="checkbox"/> Open <input type="checkbox"/> Closed Imp. Suction: <input type="checkbox"/> Single <input type="checkbox"/> Double Imp. Mount: <input type="checkbox"/> Bwn. Brgs <input type="checkbox"/> Overhung Rotation (Coupling End): <input type="checkbox"/> CW <input type="checkbox"/> CCW Bearing (Type/Number): Radial _____ Thrust _____ Coupling: Manufacturer _____ Type/Model _____ Driver Half-Coupling Mounted By: <input type="radio"/> Pump Mfr. <input type="radio"/> Driver Mfr. <input type="radio"/> Purchaser	Packing: Manufacturer _____ Type _____ Size/No. Rings _____ Mechanical Seal: API Class code _____ Manufacturer _____ Model _____ Mfr. Code _____ <input type="radio"/> Cartridge Type Required Gland Type/Mat'l.: _____ Gland Plate Taps Required for:
--	---	---

105/OS/101/207/84571896.MIS/WP51-01/26/93 11:36am

 ○ = By Purchaser ☐ = By Mfr./Purchaser ○ Quench ○ Flush ○ Drain ○ Vent

P33B - 15148

02/07/2025 146

Rev. 0

**ATTACHMENT B
EQUIPMENT MAXIMUM ENVELOPE AND MODEL NUMBER OR EQUAL**

TAG NUMBER	MODEL NUMBER*	MAXIMUM ENVELOPE (inches)		
		LENGTH	WIDTH	HEIGHT
PX-520-001	A21 Kontro-Arrange 1-1/2 x 1 x 8	52	21	16
PX-520-003	A21 Kontro-Arrange 1-1/2 x 1 x 8	52	21	16
PX-520-004	Kontro-Arrange 1-1/2 x 1 x 6	32	18	12
PX-520-006	Kontro-Arrange 1-1/2 x 1 x 6	32	18	12
PX-520-009	A21 Kontro-Arrange 1-1/2 x 1 x 8	52	21	16
PX-540-002	Viking series 897-GG-R Drive	58	14.25	15
PX-540-004	Kontro-Arrange 1 x 1 x 6	18	15	13
PX-540-006	Kontro-Arrange 1 x 1 x 6	18	15	13
PX-540-009	Kontro-Arrange 1 x 1 x 6	18	15	13
PX-540-015	Kontro-Arrange 1 x 1 x 6	18	15	13
PX-540-018	H53EH Kontro 3 x 2	69	20	73
PX-540-021	H53EH Kontro 3 x 2	69	20	73
PX-540-023	TC18 Kontro 1 x 1	20	10.5	12.5
PX-540-025	TC18 Kontro 1 x 1	29	10.5	12.5
PX-540-029	Kontro-Arrange 1 x 1 x 5	28	19	13
PX-540-036	Kontro-Arrange 1 x 1 x 5	28	19	13
PX-540-037	A21 Kontro-Arrange 1-1/2 x 1 x 8	52	21	16

* Equipment shall be of this model number or equal.

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U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 15196
IDENTIFICATION AND TAGGING METHODS
FOR MECHANICAL EQUIPMENT
B-595-P-P33B-15196

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA YES NO X
QUALITY LEVEL I II X
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

CHECKER:

James D. Lowerre, Jr. 26 Jan 93
J. D. Lowerre, Tech. Writer (Mech.) Date

D. A. Buzzelli 1-26-93
D. A. Buzzelli, Lead Disc. Checker Date

APPROVED BY:

R. B. Erickson
C. J. Divona Lead Discipline Engineer

1-26-93
Date

SECTION 15196
IDENTIFICATION AND TAGGING METHODS
FOR MECHANICAL EQUIPMENT
B-595-P-P33B-15196

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PART 2 PRODUCTS	2
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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>
A	LAYOUT EXHIBITS (TYPICAL)
B	NAMEPLATE DATA

9413202.0723

**SECTION 15196
IDENTIFICATION AND TAGGING METHODS
FOR MECHANICAL EQUIPMENT**

PART 1 GENERAL

1.1 SUMMARY

This specification section describes the technical requirements for the design, material and fabrication of permanent and temporary identification methods applicable to manufactured or procured parts, subassemblies and assemblies.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A13.1 1981 (Rev. 85) Scheme for the
Identification of Piping Systems

INSTRUMENT SOCIETY OF AMERICA (ISA)

ISA RP60.6 1984 Nameplates, Labels and Tags for
Control Centers, Recommended Practice

MILITARY STANDARDS

MIL-STD-889B 1988 (Notice 2) Dissimilar Metals

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

OSHA 29 CFR 1910.96 1990 Ionizing Radiation

1.3 RELATED REQUIREMENTS

(Not Used)

1.4 DEFINITIONS

(Not Used)

1.5 SYSTEM DESCRIPTION

(Not Used)

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Rev. 0

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Seller shall submit material safety data sheets for Buyer approval. These data sheets shall certify that all materials used for the application and removal of marking on corrosion-resistant, stainless steel and some nickel-based alloys shall be free of halides and low melting-point elements to the extent specified in Paragraph 2.1.1.1 B.

1.6.2 Seller shall submit certification of the processes used for permanent marking. Tools used to apply permanent marking and the resultant mark shall be in accordance with the applicable requirements in Paragraph 2.2. To preclude repeated examination of production marking, tools and sample markings made by said tools shall be examined to determine accordance with applicable requirements.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Materials

2.1.1.1 Material Compatibility - Materials used for permanent or temporary marking or for the removal of markings shall be physically and chemically compatible with the material to which the markings will be applied or removed. The following shall be avoided:

A. The use of dissimilar metals in permanent contact as defined in MIL-STD-889B.

B. The use on corrosion-resistant, stainless steel and some nickel-base alloys of materials containing more than:

- 1) one-half percent by weight of halides (chlorides and fluorides),
- 2) one-half percent by weight of sulfur, and

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- 3) a sum total of one-half percent by weight of low melting-point elements such as cadmium, aluminum, lead, zinc and mercury.

C. Permanent marking of critical stainless steel components using labels, tape, paint or other marking materials that could cause crevice corrosion.

2.2 FABRICATION AND MANUFACTURE

2.2.1 Requirements

2.2.1.1 Cleanliness - Surfaces to be marked shall be cleaned of oil, grease, dirt, corrosion or any other material that would adversely affect the application or adhesion of the marking.

2.2.1.2 Legibility - All markings shall be clearly legible. Color markings, including black and white, shall contrast with the color of the surface to which it is applied. Freehand lettering for the purpose of temporary marking shall be in the printed form and be uppercase (caps).

2.2.2 Permanent Identification Methods

Type 1	Vibratory Marking
Type 2	Die Stamping
Type 3	Raised marking forged or cast into the surface
Type 4	Recessed marking forged or cast into the surface
Type 5	Electrochemical etch
Type 6	Nameplate
Type 7	Self-adhesive label
Type 8	Painting
Type 9	Packaging
Type 10	Tagging

2.2.2.1 Type 1: Vibratory Marking - Vibrating tools shall be fitted with a carbide marking point or equivalent. Tools shall be adjusted to produce a shallow, rounded impression 0.003 to .101 inch in depth. The marking tool tip minimum radius shall be 0.005 inch. The size (height) of characters produced by vibratory marking shall be selected within the range of 1/16 to 1/2 inch.

2.2.2.2 Type 2: Die Stamping - Die stamps shall be low-stress type stamps. The minimum tip radius of the dies shall be in accordance with the following character sizes:

9413202-0726

Character Size (inch)	Minimum Tip Radius (inch)
1/16	0.005
3/32	0.006
1/8	0.007
3/16	0.008
1/4	0.010
3/8	0.012
1/2	0.014

- A. Impression depth shall not exceed 0.10 inch.
- B. Die stamp marking shall be applied to a flange, an integrally-cast or forged boss or pad, the base or support of the item or other visible low-stress location.
- C. The material thickness of an item to be marked shall not be reduced by die stamping to less than the minimum specified on the component drawing or specification (if available).

2.2.2.3 Types 3 and 4: Raised/Recessed Markings - Raised or recessed identification markings that are cast into the surface of the item are acceptable. Recessed markings shall not reduce the material thickness of an item to less than the minimum specified on the component drawing or specification. The size of forged or cast characters called out on the drawing or specification shall only be limited by the space available, but shall in no case be less than 0.09 inch in height.

2.2.2.4 Type 5: Electrochemical Etching - The electrolyte and neutralizer used for electrochemical etching shall be compatible with the material to be marked. The depth of etching shall be no greater than 0.5 percent of the material thickness or 0.003 inch, whichever is less. The size of characters produced by electrochemical etching shall be selected within the range of 1/16 to 1/2 inch. However, the recommended minimum size is 0.1 inch to accommodate typing applications.

2.2.2.5 Type 6: Nameplates

- A. The physical requirements (e.g., material, nameplate dimensions, character size and arrangement) for metal nameplates shall either be detailed on the applicable drawing or specification; or defined by reference to an applicable nameplate standard, specification or drawing. Metal nameplates shall be corrosion-resistant. They shall contain not less than the following information:

Equipment description
Purchase order number
Equipment item number

P.O. item number
Manufacturer's name
Manufacturer's model number
Manufacturer's serial number
Rated capacity
Size and type
Year built
Project identification CVI number (to be marked by Buyer)

A typical metal nameplate layout is shown in Attachment A.

- B. When attached by welding, metal nameplates shall be welded in accordance with the welding requirements applicable to the item. The attachment method and location on the item of either nameplate type shall be established on the basis of stress imposed on the item. The method shall consider possible crevice corrosion between the nameplate and the item surface. If the welded nameplate is removed, the affected area shall be tested in accordance with the welding requirements applicable to the item.
- C. When used, plastic nameplates shall be specified on the item drawing or specification in accordance with Attachment B. This shall include nameplate size, character size and method of attachment.

2.2.2.6 Type 7: Self-Adhesive Labels - Self-adhesive labels may be used for identification provided they are in accordance with the requirements specified in Paragraph 2.1.1.1. These labels should be placed in easily-visible locations. When used to mark components in systems such as piping or electrical systems, or used as regulatory marking, self-adhesive labels shall be in accordance with applicable government, society or industry standards and codes. For example:

- A. When marking a piping system, a recognized standard such as ANSI A13.1 shall be invoked on the applicable drawing/specification along with this specification section.
- B. If labels are used to identify system or component radiation hazards, a standard such as OSHA 29 CFR Section 1910.96 shall be specified on the applicable drawing/specification along with this specification section.

2.2.2.7 Type 8: Painting - Paints suitable for the purpose and/or as specified shall be used to apply stenciled markings to items (see Paragraphs 2.1.1.1 and 2.2.1.2). These markings should be placed in easily-visible locations. Stenciled markings may be applied using a template or silkscreen. The size of the stenciled characters specified on the drawing/specification shall be selected within the range of 1/3 to 3 inches. The color and type

of paint to be used shall also be in accordance with the drawing/specification. Crafted (freehand sign painted) application of marking in lieu of stenciling is acceptable with due consideration being given to the higher cost involved.

2.2.2.8 Type 9: Packaging - Identical items too small to be identified individually may be packaged in a box or bag marked with the item identification as shown in Paragraph 2.2.2.9 A.

2.2.2.9 Type 10: Tagging

A. Tags shall be of corrosion-resistant metal. They shall be impression-stamped with not less than the following information:

Purchase order number
Purchase order item number
Equipment item number CVI number (to be marked by Buyer)

A typical tag layout is shown in Attachment A.

B. Tags shall be attached to the component they identify with stainless steel wire. Tagging is done in addition to the equipment nameplate. Equipment shipped in fully-enclosed containers shall have the information from A. clearly marked on the container exterior.

C. Miscellaneous parts shall be tagged or marked with the equipment item number for which they are intended.

D. Equipment which contains insulating oils, antifreeze solutions or other liquids shall be prominently tagged at every opening. Tags shall indicate the nature of the contents and precautions for shipping and storage.

2.2.3 Temporary Identification Methods

Type A	Rubber stamp and ink
Type B	Rubber roller or wheel and ink
Type C	Felt-tip marking pen
Type D	Removable self-adhesive label or tape
Type E	Label attached with removable tape
Type F	Removable tag
Type G	Packaging
Type H	Scribing tool
Type J	Paint stick
Type K	Metal tag

2.2.3.1 Inks - Inks used for all type of temporary markings including felt-tipped pens, rubber stamps, rubber roller and rubber wheel

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shall be in accordance with the requirements of Paragraph 2.1.1.1 B.

- 2.2.3.2 Self-Adhesive Labels and Tape - The adhesives of self-adhesive labels and tape used for temporary marking shall be in accordance with the requirements of Paragraph 2.1.1.1.
- 2.2.3.3 Tagging - Items not suited for other methods of identification may be tagged. Tags and attaching materials shall be compatible with the item material in accordance with Paragraphs 2.1.1.1 A and 2.1.1.1 B. Materials used for temporary identification tagging shall be selected on the same basis as for permanent identification tagging (see Paragraph 2.2.2.9).
- 2.2.3.4 Packaging - Packaging requirements for temporary identification shall be the same as for permanent identification (see Paragraph 2.2.2.8).
- 2.2.3.5 Scribing Tool - Scribing tools may be used for temporary identification during fabrication or construction provided such marking is not applied to critical surfaces such as finished, machined or sealing surfaces.
- 2.2.3.6 Removal of Temporary Marking - All temporary marking shall be removed from stainless steel and corrosion-resistant material surfaces after fabrication. All visible traces shall be removed. Solvent used for marking removal shall be in accordance with Paragraph 2.1.1.1 B.
- 2.2.4 Testing
 - 2.2.4.1 Visual Inspection - Item surfaces and marking shall be visually inspected to determine accordance with the applicable requirements specified in Paragraphs 2.2.1.1 and 2.2.1.2.

PART 3 EXECUTION

(Not Used)

END OF SECTION

ATTACHMENT A
LAYOUT EXHIBITS (TYPICAL)

EXHIBIT 1. NAMEPLATE LAYOUT

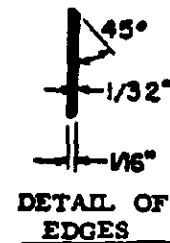
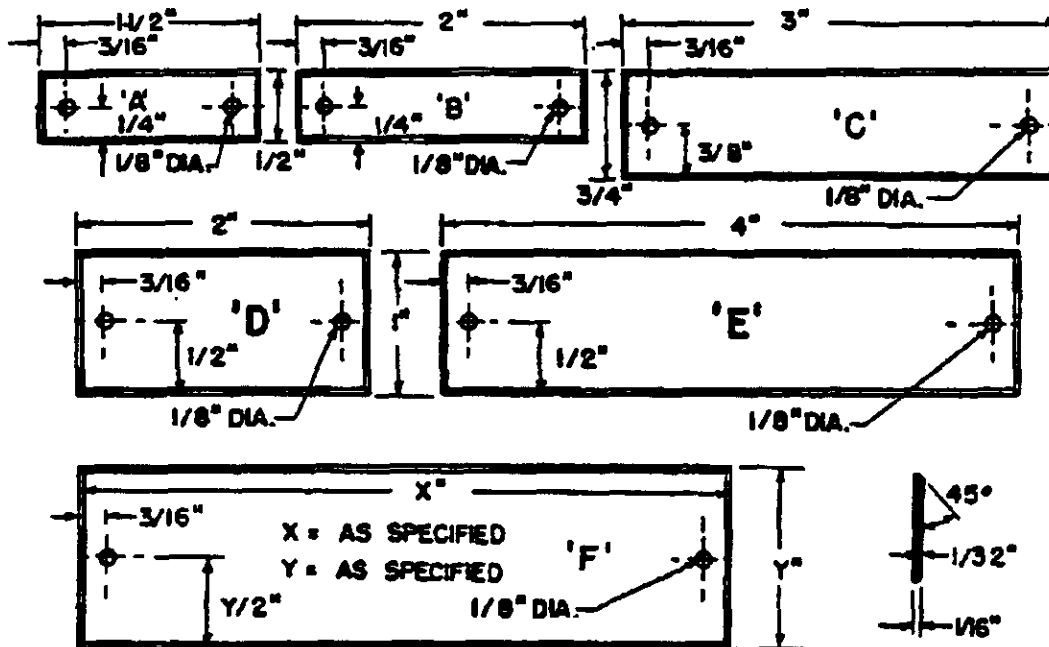
P.O. NUMBER	ITEM NUMBER
SERIAL NUMBER	MODEL NUMBER
EQUIPMENT DESCRIPTION	
MANUFACTURED BY	
SIZE	TYPE
RATED CAPACITY	YEAR BUILT
PROJECT	

EXHIBIT 2. TAG LAYOUT

P.O. NUMBER
P.O. ITEM NUMBER
EQUIPMENT ITEM NUMBER

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ATTACHMENT B
NAMEPLATE DATA



3/32" SAMPLE 7/32" SAMPL
1/8" SAMPLE 1/4" SAMP
5/32" SAMPLE 5/16" SAM

ACTUAL LETTER SIZES

NAMEPLATE
SIZE

A & B
C
D & E
F

RECOMMENDED
LETTER SIZE

5/32"
3/16"
7/32"
As Specified

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NOTES:

1. Unless otherwise specified, nameplate material shall be laminated plastic stock, 1/8-inch thick. Surface shall be white. Core shall be black.
2. Nameplate edges shall be beveled in accordance with the figure. They shall be smooth and without burrs. Letters shall be sharp and clear, similar to the style depicted in the figure.
3. 4-40 x 3/8 binding head self-tapping machine screws, pull-stem rivets, 4-40 machine screws or 1/8-inch diameter drive rivets shall be used to fasten nameplates. Fastener materials shall be compatible with base materials in accordance with equipment specifications. Contact adhesive or silicon adhesive may be used as an alternative fastening method where screws/rivets are not desirable.
4. The nameplate's usable area, letter size and spacing shall be in accordance with ISA RP60.6, Appendices A-2 and A-3.

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U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 15648
PLATE HEAT EXCHANGERS
B-595-P-P33B-15648

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA YES NO X
QUALITY LEVEL I II X
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

CHECKER:

J. J. Ichkhan 1/26/93
J. J. Ichkhan, Mechanical Eng. Date

D. A. Buzzelli 1-26-93
D. A. Buzzelli, Lead Disc Checker Date

APPROVED BY:

R. B. Erickson
C. J. Divona Lead Discipline Engineer

1-26-93
Date

Rev. 0

SECTION 15648
PLATE HEAT EXCHANGERS
B-595-P-P33B-15648

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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>
A	DATA SHEETS
B	EQUIPMENT MAXIMUM ENVELOPE AND MODEL NUMBER OR EQUAL

9413202.0735

**SECTION 15648
PLATE HEAT EXCHANGERS**

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the minimum technical requirements for design, fabrication and testing of the plate heat exchangers. These heat exchangers will be installed in the Hanford Waste Vitrification Plant in Richland, Washington.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- | | |
|-------------|---|
| ANSI B16.5 | 1988 Pipe Flanges and Flanged Fittings |
| ANSI B16.11 | 1980 Forged Steel Fittings, Socket Welding and Threaded |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- | | |
|-----------------|---|
| ASTM A480/A480M | 1991 (Rev. A) General Requirements for Flat Rolled Stainless and Heat Resisting Steel Plate, Sheet, and Strip |
|-----------------|---|

**AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
Boiler and Pressure Vessel Code**

- | | |
|-------------------------------|--|
| ASME Section II, Part A | 1989 Material Specifications - Ferrous Materials |
| ASME Section V | 1989 Nondestructive Examination |
| ASME Section VIII, Division 1 | 1989 Rules for Construction of Pressure Vessels |
| ASME Section IX | 1989 Welding and Brazing Qualification |

AMERICAN WELDING SOCIETY, INC. (AWS)

- | | |
|----------|--|
| AWS D1.1 | 1990 Structural Welding Code Steel, 12th Edition |
|----------|--|

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC SP-6

1989 Surface Preparation Specification
No. 6, Commercial Blast Cleaning

1.3 RELATED REQUIREMENTS

Specification Section 01730 Operation and Maintenance Data
Specification Section 05063 Welding Pressure Vessels
Specification Section 13252 Precautions for Fabrication,
Handling and Storage of Stainless
Steel and Nickel Alloys
Specification Section 15196 Identification and Tagging Methods
for Mechanical Equipment

1.4 DEFINITIONS

FAT - Factory Acceptance Test
NDE - Nondestructive Examination

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and
Data Requirements section of the Order/Subcontract.

1.6.1 General Arrangement Drawings

General arrangement or outline drawings shall be submitted. These
drawings shall contain the following information:

- A. Service, item number, project name and location, purchase
order number and Manufacturer's shop order number.
- B. All overall dimensions, diameters and elevations of all
assemblies and subassemblies. This shall include all
clearances which must be maintained.
- C. Thickness of all materials used (including supports).
- D. Locations and details of all structural and attachment
welds.

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- E. Location (elevation, projection and orientation) of every connection to the equipment (i.e., nozzles, brackets, clips, supports, lifting lugs, etc.). Location of nameplates.
- F. Location and size of all bolts and bolt-slotted holes for exchanger support.

1.6.2 Detail Drawings

Shop fabrication or cross sectional and other detail drawings shall be submitted for Buyer approval. These drawings shall contain the following information:

- A. Full dimensions of all parts and subassemblies. Tolerances and finishes required wherever applicable.
- B. A complete list of materials used for manufacture of the plate heat exchanger. This list shall include certifications or degree of testing if this forms part of the material specifications. This is required if the assembly drawings list the materials used in general terms only.
- C. Gasket sketches for all joints. These shall provide dimensions, number required, type and materials.

1.6.3 Completed specification Data Sheets, reflecting the design parameters shown on Data Sheets P33B-DS-1 and DS-2 (Attachment A).

1.6.4 Mechanical design calculations for the frame assembly shall be submitted. These calculations shall be complete, with all steps and data identified, to show accordance with the contract specifications and its supplements, as well as all applicable codes and standards. The calculations shall be complete to permit second-party review. Where computers are used for code calculations, all assumptions and input data shall be supplied together with the computer-generated output.

1.6.5 Code Data Book shall include the following:

- A. Certified mill test reports. These reports shall state the specification to which the material complies, the chemical analysis, physical properties and any heat treatment the material was given.
- B. Manufacturer Data Report, Forms U-1, U-1A or U-2; in accordance with ASME Section VIII, Division 1.
- C. Nameplate rub-off.
- D. Hydrotest chart.

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E. Nondestructive examination (NDE) test results.

F. "As-Built" Data Sheets.

1.6.6 Welding submittals shall be in accordance with ASME Section IX, AWS D1.1 and Specification Section 05063.

1.6.7 Assembly Instruction drawings and complete installation manuals shall be submitted for the plate heat exchanger.

1.6.8 Factory Acceptance Tests (FATs) as defined in Paragraph 2.5, and FAT report.

1.6.9 Spare Parts List

A list of recommended spare parts for one (1) year's routine operation shall be supplied. This list shall include sufficient data to permit procurement from the original manufacturer or any subsupplier.

1.6.10 Inspection and checklist shall be submitted in accordance with Paragraph 2.5.3.

1.6.11 Operation and Maintenance Manuals

Seller shall provide operation and maintenance manuals. These manuals shall fully detail sequences of disassembly, repair, adjustment, reassembly, lubrication and troubleshooting. Troubleshooting sections shall include fault trees to guide both mechanical and electrical diagnostics. The manuals shall include reduced-size 11x17 copies of any assembly drawing, subassembly drawing or parts list needed for routine maintenance and overhaul. This data shall be submitted in accordance with Specification Section 01730.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Site Environmental Conditions

A. Site Elevation 714 feet above sea level

B. Barometric Pressure 14.3 psia

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C. Outside Design Temperature

- 1) Maximum Design Temperature 110°F
- 2) Minimum Design Temperature -20°F
- 3) Wet Bulb Design Temperature 68°F

1.8.2 Operating Environment

- A. Normal Temperature 60°F to 104°F
- B. Maximum Temperature 104°F
- C. Relative Humidity Not controlled

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Materials

Plate materials shall be Type 304L stainless steel in accordance with ASTM A480/A480M. The material specifications, grade and condition shall be as specified on the exchanger data sheets. All pressure-retaining materials shall be in accordance with ASME Section II, Part A.

2.1.2 Equipment

The following requirements shall apply to all plate-type heat exchangers furnished in accordance with this specification section. Special heat exchanger requirements established by Data Sheets P33B-DS-1 and DS-2 (Attachment A).

A. Seller shall guarantee all plate heat exchangers against defective design, material and workmanship. Seller shall also guarantee exchanger performance with regard to capacity, heat duty and pressure drop in accordance with the process conditions specified on the individual data sheets.

B. Process and Thermal Design

- 1) Seller shall thermally and hydraulically design the exchangers to meet the requirements listed on Data Sheets P33B-DS-1 and DS-2 (Attachment A).
- 2) Cleanliness factors or fouling resistances to be used in the thermal design shall be specified on the data sheets.

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- 3) The exchanger frame shall be designed to permit future installation of additional plates. This additional capacity shall be not less than 20 percent.
- 4) The velocity through stainless steel exchanger inlet and outlet nozzles shall not be greater than 15 feet per second.
- 5) Pressure drop shall be calculated based on the clean condition.
- 6) The combined pressure drop attributed to the entrance and exit flow ports shall not exceed 50 percent of the total calculated pressure drop.

2.2 FABRICATION AND MANUFACTURE

2.2.1 Plates

- 2.2.1.1 Plates shall be designed such that each plate can withstand full maximum operating pressure with no pressure on the adjacent plates. The minimum thickness of plates before pressing shall be 0.024 inch nominal.
- 2.2.1.2 Design of plates shall permit metal-to-metal contact between adjacent plates.
- 2.2.1.3 Gasket grooves shall be designed to contain gaskets within the grooves, provide full gasket support and prevent over-compression of the gaskets. This shall be accomplished by metal-to-metal plate contact outboard of the gasket grooves.
- 2.2.1.4 Port holes not feeding passes between plates shall be fully-gasketed and vented to the atmosphere.
- 2.2.1.5 Plates shall be fully supported from the top carrying bar. They shall be guided only by the bottom bar with reinforced slots. Slots shall be an integral part of the plate.
- 2.2.1.6 End plates shall be furnished at both the fixed and movable covers. These end plates shall provide sealing of the first and last flow passes and provide support to the adjacent plates.

2.2.2 Plate Gaskets

- 2.2.2.1 Gaskets shall be compressed to achieve metal-to-metal contact between plates during operation.
- 2.2.2.2 An adhesive compound compatible with the gasket material and of sufficient thickness to ensure bond strength between plate and gasket shall be applied to the plate gasket groove surface.

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- 2.2.2.3 Gasket plate surface shall be thoroughly cleaned by means of solvent cleaning or electro-polishing. Surface shall be dried before adhesive application. Emery cloth or abrasive powders shall not be used to clean gasket grooves.
- 2.2.2.4 The adhesive (with gasket in place) shall be allowed to cure for not less than one hour. The curing temperature shall be not less than the normal operating temperature. Low-pressure saturated steam or hot water may be used as the heating media. After curing, all gaskets shall be checked. Deformed gaskets shall be replaced and the curing operation repeated.
- 2.2.2.5 All gaskets except for those between end plates and the head shall be identical. One-piece gaskets are required.
- 2.2.2.6 Relieving grooves shall be provided in the outside gasket in those locations where an internal gasket is used. The relieving grooves should be located such that no contamination of liquids can occur.
- 2.2.3 Fixed and Movable Covers
- 2.2.3.1 For single pass counter-current designs, all nozzle connections shall be located in the fixed cover.
- 2.2.3.2 Slotted holes for compression bolts shall be uniformly distributed around the periphery of both fixed and movable covers.
- 2.2.3.3 The movable covers shall be supported from the upper carrying bars by means of bearings. Covers shall be guided by the bottom bars.
- 2.2.3.4 Fixed or movable covers shall not be provided with stiffeners to compensate for thickness.
- 2.2.4 Compression Bolts and Nuts
- 2.2.4.1 The bolt length shall accommodate the additional plates provided for in Paragraph 2.1.2 B(3).
- 2.2.4.2 The bolts shall have a minimum diameter of not less than 1/2 inch.
- 2.2.4.3 Nuts at the fixed cover end shall be captive. Washers shall be provided at both ends of compression bolts.
- 2.2.5 Top Carrying Bar
- 2.2.5.1 A smooth surface shall be provided along the length of the carrying bar to allow easy movement of the movable covers.
- 2.2.5.2 The carrying bar shall be designed to support 1.5 times the weight of the flooded exchanger.

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2.2.6 Nozzles and Attachments

2.2.6.1 Bolt holes of flanged nozzles shall straddle the centerline.

2.2.6.2 Flanged fittings and nozzles shall be in accordance with ANSI B16.5.

2.2.6.3 Forged steel lap joint flanges shall be used with all stub ends. All welds shall be examined by liquid penetrant after all welding and machining operations are complete.

2.2.6.4 Vent and drain connections shall be provided at the high and low points of each exchanger.

2.2.6.5 All process nozzles shall have a pipe size of not less than 1-1/2 inch. These nozzles shall be flanged. All auxiliary connections shall be flanged or threaded as specified on Data Sheets P33B-DS-1 and DS-2 (Attachment A). Auxiliary connections shall be blind flanged or plugged as required.

2.2.6.6 Standard 6000-pound couplings shall be used for threaded connections. Bar stock plugs shall be in accordance with ANSI B16.11. These plugs shall be of the round head type.

2.2.6.7 Coupling orientations and projections shall not interfere with nozzle flange bolting wherever couplings are required in exchanger nozzles.

2.2.7 Miscellaneous

2.2.7.1 The fixed cover end shall be supported by either two legs or one leg extending along the entire width of the exchanger. The other end shall have only one support leg.

2.2.7.2 Exchanger shall be fully self-draining.

2.2.7.3 Lifting lugs shall be provided. They shall be designed to support twice the exchanger's maximum dry weight.

2.2.7.4 All plate exchangers shall bear an ASME Code Stamp.

2.2.8 Anchorage Provisions

The Melter Cooling Water Cooler EX-460-001A/B, shall have provisions to be anchored with a minimum of four 1/2 inch diameter bolts. Bolt holes shall be 11/16 inch diameter. The process Cooling Water Cooler EX-450-001A/B, shall have provisions to be anchored with a minimum of four 5/8 inch diameter bolts. Bolt holes shall be 13/16 inch diameter.

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2.2.9 Envelope

The maximum available envelope for the plate heat exchangers and the model number or equal are shown in Attachment B.

2.3 LABELING

Labeling shall be in accordance with Specification Section 15196, Paragraph 2.2.2, Type 6. This shall be in addition to the manufacturer's identification plate.

2.4 COATINGS

After completion of all fabrication procedures the external surfaces of each heat exchanger shall be thoroughly cleaned of all foreign material, including rust, in accordance with SSPC SP-6. Manufacturer's standard prime and finish paint or coatings shall be applied. Stainless steel surfaces shall not be painted unless specified otherwise.

2.5 INSPECTION AND FACTORY ACCEPTANCE TESTS (FATs)

2.5.1 Nondestructive Examination (NDE)

- A. Nondestructive examination methods and acceptance shall be in accordance both with ASME Section V and Specification Section 05063.
- B. The specific requirements for nondestructive examination shall be as shown on Seller's drawings by NDE symbols.

2.5.2 Pressure Tests

- A. The plate heat exchanger shall be hydrostatically tested at 1.5 times the design pressure corrected for temperature. The hydrotest procedure shall be in accordance with ASME Section VIII, Division 1, Paragraph UG-99(b). All tests shall be made in the presence of a designated inspector and with his/her specific authorization. Test pressure shall be maintained for not less than one hour.
- B. The test medium for hydrostatic testing shall be in accordance with Specification Section 13252.
- C. Additional welding on the exchanger shall not be permitted after hydrostatic tests are complete.
- D. The exchanger shall be thoroughly drained and dried after hydrostatic testing.

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2.5.3 Shop Inspection

- A. Seller shall perform shop inspections of the exchanger. Seller personnel who make inspections of the exchanger shall be qualified in accordance with ASME Section VIII, Division 1, Paragraph UG-91(a). The reference to the inspector in ASME Section VIII, Division 1, Paragraph UG-90 shall also apply to Seller.
- B. The alternative inspections in accordance with ASME Section VIII, Division 1, Paragraph UG-90(c-2) shall not be permitted.

2.6 PACKAGING

- 2.6.1 Preparation for shipment and packing shall be in accordance with seller's standards. At minimum, packaging shall provide protection against corrosion and damage during normal handling, shipping and storage. Minimum preparation shall include the requirements listed below.
- 2.6.2 Machined surfaces, threads, bearings and bearing housings shall be protected during shipment by application of grease or other suitable rust-inhibiting compound.
- 2.6.3 Flanged openings shall be covered with wood or plastic protectors. Protectors shall be installed with a minimum of four (4) full diameter steel bolts and nuts of material compatible with the flange.
- 2.6.4 Threaded connections and tapped holes shall be capped or plugged to prevent thread damage. Compatible materials shall be used.
- 2.6.5 Plate heat exchanger shall be shipped fully assembled.
- 2.6.6 Bracing, supports and rigging connections shall be provided to prevent damaged during shipment, loading and unloading.
- 2.6.7 Separate or loose parts shall be completely boxed and attached to the main item to be shipped as a unit. All shipping boxes shall be identified by the Seller's order number, equipment number and equipment description.

PART 3 EXECUTION

(Not Used)

END OF SECTION

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ATTACHMENT A

**FLUOR DANIEL**

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

PLATE HEAT EXCHANGER

NO.	BY	REVISION	SHEET NO.	REV.
DATE			P33B-DS-1	0
			DATE	CONTRACT
			03-20-90	845734
			TAG NO	
			EX-460-001A AND EX-460-001B	
			SPECIFICATION SECT NO.	
			15648	
			FOR CLIENT USE	
			ORIG BY	CHK'D
			S. Strausburg	KJM
			APPR'D	

SERVICE MELTER COOLING WATER COOLERDUTY 9.42 X 10⁶ BTU/HR

VENDOR _____

NO OF SECTIONS PER UNIT: _____

NO OF UNITS: 2 (ONE OPERATING - ONE SPARE)DRAWING NO: H-2-12335 SHIT 1EXCHANGER TYPE: HORIZONTAL ☒ VERTICAL ☐

MANUFACTURERS IDENTIFICATION NO _____

FLUID CIRCULATED:		HOT SIDE	COLD SIDE
		MELTER COOLING WATER	TOWER COOLING WATER
TOTAL FLUID:	LB/HR	210,000	21,000
VAPOR:	LB/HR		
LIQUID:	LB/HR	210,000	21,000
STEAM:	LB/HR		
NON CONDENSABLES:	LB/HR		
FLUID VAPORIZED:	LB/HR		
FLUID CONDENSED:	LB/HR		
M. W. VAPOR	IN/OUT		
TEMPERATURE IN:	°F	115	75
TEMPERATURE OUT:	°F	113	85
SP GR:			
SP HT:	BTU/LB X °F		
TH COND:	BTU/HR°F/FT ² /FT		
VISCOSITY:	CPS		
LATENT HEAT:	BTU/LB		
PRESSURE DROP (MAX ALLOW):	PSI	10	0.1
PASSES:			
PASSAGES PER PASS:			
NO OF PLATES:			
HEAT TRANSFER AREA:	FT ²		
LMTD			
OVERALL COEFF:			
FOULING:	Hrx°FxSq.Fv/BTU	.0005	.001
INLET PRESS (MAX):	PSI	50 (100 PSIG DESIGN)	58 (100 PSIG DESIGN)

MECHANICAL DATA FOR ONE UNIT

FRAME SIZE _____

WEIGHTS: PLATES: _____ LB FRAME: _____ LB TOTAL FLOODED: _____ /LB

MAX PRESSURES: WORKING: 100 PSIG TEST: _____ PSI MAX WORKING TEMPERATURE: 150 °F

CONNECTIONS: HOT SIDE 4" 150# RF COLD SIDE 4" 150# RF

SIZE & TYPE _____

FRAME MATERIAL: _____ FINISH _____

PLATE MATERIAL: 304L SS FINISH _____

GASKET MATERIAL: _____

BUSH MATERIAL: _____

EXTRAS _____

THERMOMETERS: _____

PRESSURE GAUGES: _____

REMARKS: 1) MCW SIDE MAY BE SUBJECTED TO NITRIC ACID DECONTAMINATION2) TWO COOLERS ARE REQUIRED: 1 OPER., 1 SPARE

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SAFETY CLASSIFICATION 3

P33B-15648

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ATTACHMENT A

<p>FLUOR DANIEL</p> <p>U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838</p> <p>PLATE HEAT EXCHANGER</p>	NO.	BY DATE	REVISION	SHEET NO. P33B-DS-2	REV. 0
	▲			DATE 05-08-90	CONTRACT 845734
	▲			TAG NO. EX-450-001 AND EX-450-001B	
	▲			SPECIFICATION SECT NO. 15648	
	▲			FOR CLIENT USE	
	▲			ORIG BY S. Strausburg	CHK'D KJM

SERVICE PROCESS COOLING WATER COOLER DUTY 27.3 X 10⁶ BTU/HR VENDOR _____ NO OF SECTIONS PER UNIT: _____ NO OF UNITS: 2 (ONE OPERATING - ONE SPARE)	DRAWING NO: H-2-12335H SHT 1 EXCHANGER TYPE: HORIZONTAL <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> MANUFACTURERS IDENTIFICATION NO _____
--	--

		HOT SIDE	COLD SIDE
FLUID CIRCULATED:		PROCESS COOLING WATER	COOLING TOWER WATER
TOTAL FLUID:	LB/HR	1,000,000	1,362,500
VAPOR:	LB/HR		
LIQUID:	LB/HR		
STEAM:	LB/HR		
NON CONDENSABLES:	LB/HR		
FLUID VAPORIZED:	LB/HR		
FLUID CONDENSED:	LB/HR		
M. W. VAPOR	IN/OUT		
TEMPERATURE IN:	°F	107.3	75
TEMPERATURE OUT:	°F	80	95
SP GR:			
SP HT:	BTU/LB X °F		
TH COND:	BTU/HR°F/FT ² /FT		
VISCOSITY:	CPS		
LATENT HEAT:	BTU/LB		
PRESSURE DROP (MAX ALLOW):	PSI	5	10
PASSES:			
PASSAGES PER PASS:			
NO OF PLATES:			
HEAT TRANSFER AREA:	FT ²		
LMTD			
OVERALL COEFF:			
FOULING:	Hx°FxSq. Ft/BTU	.0005	.001
INLET PRESS (MAX):	PSI	7.5	30*

MECHANICAL DATA FOR ONE UNIT			
FRAME SIZE	PLATES: _____ LB	FRAME: _____ LB	TOTAL FLOODED: _____ /LB
MAX PRESSURES:	WORKING: 100/8	PSIG	TEST: _____ PSI
CONNECTIONS:	HOT SIDE 12 150# RF		COLD SIDE 10 150# RF
SIZE & TYPE			
FRAME MATERIAL:	FINISH _____		
PLATE MATERIAL: 304L SS	FINISH _____		
GASKET MATERIAL:	_____		
BUSH MATERIAL:	_____		
EXTRAS	_____		
THERMOMETERS:	_____		
PRESSURE GAUGES:	_____		

REMARKS: *MINIMUM TSW PRESSURE IS 20.1 (REF. 3222-PR-4401) + 10 PSI = 30.1; USE 30 PSIG	SAFETY CLASSIFICATION 3
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ATTACHMENT B
EQUIPMENT MAXIMUM ENVELOPE AND
MODEL NUMBER OR EQUAL

TAG NUMBER	MODEL NUMBER*	MAXIMUM ENVELOPE (inches)		
		LENGTH	WIDTH	HEIGHT
EX-450-001A	Alfa Laval Model A20-BFG	132	33	95
EX-450-001B	Alfa Laval Model A20-BFG	132	33	95
EX-460-001A	Alfa Laval Model B10-BFG	36	19	39
EX-460-001B	Alfa Laval Model B10-BFG	36	19	39

* Equipment shall be of this model number or equal.

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U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 15649
METERING PUMPS
B-595-P-P33B-15649

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA YES NO X
QUALITY LEVEL I II X
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

CHECKER:

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1-26-93
Date

D. A. Buzzelli
D. A. Buzzelli, Lead Disc. Checker

1-26-93
Date

APPROVED BY:

R. B. Erickson
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1-26-93
Date

SECTION 15649
METERING PUMPS
B-595-P-P33B-15649

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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>
A	DATA SHEETS
B	EQUIPMENT MAXIMUM ENVELOPE AND MODEL NUMBER OR EQUAL

9413202.0750

**SECTION 15649
METERING PUMPS**

PART 1 GENERAL

1.1 SUMMARY

This specification section defines the technical requirements for the design, fabrication, inspection and testing of metering pumps. The metering pumps shall be of the controlled volume type.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A217/A217M 1991 Standard Specification for Steel Castings, Martensitic Stainless and Alloy for Pressure Containing Parts, Suitable for High Temperature Service

**AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
Boiler and Pressure Vessel Code**

ASME Section VIII, 1989 Rules for Construction of
Division 1 Pressure Vessels

HYDRAULIC INSTITUTE (HI)

HI 1983 Standards for Centrifugal, Rotary and Reciprocating Pumps, 14th Edition

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC SP-6 1989 Surface Preparation Specification No. 6, Commercial Blast Cleaning

1.3 RELATED REQUIREMENTS

Specification Section 01730 Operation and Maintenance Data

Specification Section 15196 Identification and Tagging Methods for Mechanical Equipment

Specification Section 16150 Motors - Induction for General Service

1.4 **DEFINITIONS**

CMTR - Certified Material Test Report

FAT - Factory Acceptance Test

1.5 **SYSTEM DESCRIPTION**

(Not Used)

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Certified Material Test Reports (CMTRs) for the metering pumps in accordance with the requirements of this specification section and Data Sheets P33B-DS-1 through DS-3 (Attachment A).

1.6.2 Metering pump and motor outline drawing. Dimensions, weights, anchor bolts and base plate details shall be submitted.

1.6.3 A list of manufacturer's recommended spare parts for one (1) year's routine operation. Include sufficient data to permit procurement either from the original manufacturer or any subsupplier.

1.6.4 Operation and maintenance manuals in accordance with Specification Section 01730. Complete installation manuals shall also be submitted.

1.6.5 **Design Calculations**

A mechanical design analysis shall be submitted. This analysis shall include supporting calculations used to establish connected horsepower, shaft sizes, bearing loads and operating characteristics. Calculations shall be complete and in sufficient detail to permit a second-party review.

1.6.6 Seller shall submit Factory Acceptance Test (FAT) procedures in accordance with Paragraph 2.5.1.

1.6.7 Seller shall submit certified performance test results prior to shipment in accordance with Paragraph 2.5.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

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1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

- A. Site Elevation 714 feet above sea level
- B. Barometric Pressure 14.3 psia
- C. Outside Design Temperature
 - (1) Maximum Design Temperature 110°F
 - (2) Minimum Design Temperature -20°F
 - (3) Wet Bulb Design Temperature 68°F

1.8.2 Operating Environment

- A. Normal Temperature 60°F to 104°F
- B. Maximum Temperature 104°F
- C. Relative Humidity Not controlled

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. The controlled-volume metering pump furnished in accordance with this specification section shall be capable of continuous operation throughout the range of the pump's capacity. The pump shall be of the diaphragm type, automatically controlled by an outside electrical signal. The diaphragm shall be actuated by a mechanically-coupled push rod. The diaphragm isolates the push rod from the process fluid. A built-in relief valve shall be included to relieve the pump's full capacity. This relief valve shall be set at 20 percent above the maximum operating discharge pressure. Guided, controlled-travel, double-ball check valves shall be installed on both suction and discharge. Valves shall have renewable seats of either the screwed-in or shouldered type. Oil lubrication shall be performed either by splash or force-feed system. The pump shall be provided with a manual local stroke adjustment. This is in addition to the remote volume adjuster.
- B. The metering pump shall be furnished with an automatic volume control. The volume/capacity control shall be continuously variable from no flow to maximum capacity condition. Repetitive accuracy of all the volume adjustments

9413202.0753

Rev. 0

shall be not less than 98 percent between the range of 10 to 100 percent of the specified pump capacity.

2.2 FABRICATION AND MANUFACTURE

- 2.2.1 Material for the metering pump shall be stainless steel in accordance with ASTM A217/A217M. Castings shall be sound. No shrink, blow holes, scale, blister and other defects shall be permitted. Surfaces shall be cleaned by manufacturer's standard methods. All casting burrs shall be filed or ground flush with the casting surface. The use of plastic or cement compounds to repair leaks and defects in pressure casings shall not be permitted.

Design stress, temperature restrictions and physical properties for the pump material shall be in accordance with the limitations for similar materials in ASME Section VIII, Division I. Pressure-containing parts shall be built in accordance with ASME Section VIII, Division I. Code stamp and data report forms are not required.

- 2.2.2 The electrical motor for the metering pump shall be in accordance with Specification Section 16150.
- 2.2.3 The pump base shall have provisions to accommodate the minimum anchorage requirements shown below. The bolt holes shall be 1/8" larger than the required bolt size.

ITEM	ANCHOR BOLT NO. AND SIZE
PX-540-038A PX-540-038B PX-540-038C PX-540-038D	Three - 5/16" diameter bolts
PX-540-031	Four - 1/2" diameter bolts
PX-540-033	Four - 1/2" diameter bolts

- 2.2.4 Flexible couplings and baseplate are used as required by the pump design and manufacturer's standards.
- 2.2.5 The maximum envelope for the metering pumps and the model number or equal are shown in Attachment B.

2.3 LABELING

Labeling shall be in accordance with Specification Section 15196, Paragraph 2.2.2, Type 6. Such labeling shall be in addition to the manufacturer's identification plate.

The pump shall be provided with a cast in or permanently attached direction of rotation arrow located on the drive end of the pump.

2.4 COATINGS

After completion of all fabrication procedures the external surfaces of each pump shall be thoroughly cleaned of all foreign material, including rust, in accordance with SSPC SP-6. Manufacturer's standard prime and finish paint or coatings shall be applied. Stainless steel surfaces shall not be painted unless specified otherwise.

2.5 TESTING

2.5.1 Seller shall provide test procedures that demonstrate the performance characteristics of the metering pump. Test procedures shall be approved by Buyer before use.

2.5.2 Factory Acceptance Tests (FATs)

Factory acceptance tests shall be performed in accordance with HI requirements.

2.5.3 Test procedures for hydrostatic testing, production testing and calibration testing with inspection shall be in accordance with HI test standards.

2.5.4 Seller shall provide certified results for all tests performed.

2.6 PACKAGING

2.6.1 Preparation for shipment and packing shall be in accordance with Seller's standards. At minimum, packaging shall provide protection against corrosion and damage during normal handling, shipping and storage. Minimum preparation shall include the requirements listed below.

2.6.2 Machined surfaces, threads, bearings and bearing housings shall be protected during shipment by application of grease or other suitable rust-inhibiting compound.

2.6.3 Flanged openings shall be covered with wood or plastic protectors. Protectors shall be installed with a minimum of four (4) full diameter steel bolts and nuts of compatible material with the flange.

2.6.4 Threaded connections and tapped holes shall be capped or plugged to prevent thread damage. Compatible materials shall be used.

2.6.5 Pump Unit Assemblies shall be shipped fully assembled on baseplate.

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- 2.6.6 Bracing, supports and rigging connections shall be provided to prevent damage during shipment, loading and unloading.
- 2.6.7 Separate or loose parts shall be completely boxed and attached to the main item to be shipped as a unit. All shipping boxes shall be identified by the Seller's order number, equipment number and equipment description.

PART 3 EXECUTION

(Not Used)

END OF SECTION

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ATTACHMENT A



FLUOR DANIEL

DATA SHEET

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

METERING PUMPS DIAPHRAGM TYPE

NO. △ △ △ △ △ △	BY DATE	REVISION	SHEET NO. P33B-DS-1	REV. 0
			DATE 04-13-89	CONTRACT 845734
			TAG NO. PX-540-031	
			SPECIFICATION SECT NO. 15649	
			FOR CLIENT USE	
			ORIG BY J. Janzen	CHK'D SSL

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: **H-2-123362-21 (SS 15649)**

Service DIATOMACEOUS EARTH SLURRY FEED PUMP	No. Motor Driven 1	PUMP MATERIALS
Pump Mfr. _____	Pump Tag No. PX-540-031	Casing 316L S.S.
Size & Type _____	DIATOMACEOUS EARTH SLURRY	Impeller _____
No. Stages _____	FEED PUMP	Internal Parts 316L S.S.
Serial No. _____	Motor Tag No. SAME	No. Pumps Req 1
	Motor Provided By MANUFACTURER	No. Turbine Driven N.A.

LIQUID	OPERATING CONDITIONS	SITE CONDITIONS
Name DIATOMACEOUS EARTH SLURRY	Capacity (U.S. GPM):	Temp. (°F): Max. _____ Min. _____
(5% WT)	Normal 5 Rated 6.88	Rel. Humid. (%): Max. _____ Min. _____
Pumping Temperature (°F):	Discharge Pressure (PSIG): 59.7	Altitude (Feet): _____
Normal 77 Max. 77 Min. _____	Suction Pressure (PSIG):	<input type="radio"/> Indoor <input type="radio"/> Heater <input type="radio"/> Roof
Specific Gravity: @ 77 °F = 1.027	Max. -0.5 Rated -0.4	<input type="radio"/> Outdoor <input type="radio"/> Unheated <input type="radio"/> Sun
Vapor Press. (PSIA): 0.46	Differential Pressure (PSI): 60.1	Area Classification: 3
Viscosity (CP): @ 77 °F = 1.106	Differential Head (Feet): 134.9	Other: _____
Corrosion/Erosion Caused By: _____	NPSH Available (Feet): 30.1	Remarks: _____
Remarks: _____	Hydraulic Power (HP): 0.241	

PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.: _____	Minimum Continuous Flow (GPM): _____	NPSH Required (Feet Water): _____
Speed (RPM): _____	Thermal _____ Stable _____	3% Head Drop _____
Efficiency (%): _____	Max. Head Rated Imp. (Feet): _____	Suction Specified Speed: _____
Rated Power (BHP): _____	Max. Power Rated Imp. (BHP): _____	

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONNECTIONS	SIZE	TYPE
Suction					Drain		
Discharge					Vent		
					Pressure Gage		
					Warm Up		
					Balance Line		

Casing Mount: <input type="checkbox"/> Foot <input type="checkbox"/> Bracket Centerline <input type="checkbox"/> Near Cntrl. <input type="checkbox"/> Inline Casing Split: <input type="checkbox"/> Axial <input type="checkbox"/> Radial Casing Type: <input type="checkbox"/> Diffuser <input type="checkbox"/> Staggered <input type="checkbox"/> Single Volute <input type="checkbox"/> Double Volute Max. Allowable Pressure (PSIG): At 60°F _____ At Nom. Pump Temp. _____ Hydro Test Pressure (PSIG): _____ Lubrication Type: <input type="checkbox"/> API 614 <input type="checkbox"/> Grease <input type="checkbox"/> Ring Oil <input type="checkbox"/> Oil Mist <input type="checkbox"/> Flood <input type="checkbox"/> Flinger <input type="checkbox"/> Pressure Remarks: _____	Impeller Diameter (Inches) Rated _____ Max. _____ Min. _____ Impeller Type: <input type="checkbox"/> Open <input type="checkbox"/> Closed Imp. Suction: <input type="checkbox"/> Single <input type="checkbox"/> Double Imp. Mount: <input type="checkbox"/> Btwn. Brgs <input type="checkbox"/> Overhung Rotation (Coupling End): <input type="checkbox"/> CW <input type="checkbox"/> CCW Bearing (Type/Number): Radial _____ Thrust _____ Coupling: Manufacturer _____ Type/Model _____ Driver Half-Coupling Mounted By: <input type="radio"/> Pump Mfr. <input type="radio"/> Driver Mfr. <input type="radio"/> Purchaser	Packing: Manufacturer _____ Type _____ Size/No. Rings _____ Mechanical Seal: API Class code _____ Manufacturer _____ Model _____ Mfr. Code _____ <input type="radio"/> Cartridge Type Required Gland Type/Mat'l.: _____ Gland Plate Taps Required for:
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105/OS1101/204/84571888.MIS/WP51-012593

☐ = By Purchaser ☐ = By Mfr./Purchaser ☐ Quench ☐ Flush ☐ Drain ☐ Vent

P33B - 15649

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ATTACHMENT A


**FLUOR DANIEL
DATA SHEET**

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

METERING PUMPS

NO.	BY DATE	REVISION	SHEET NO. P33B-DS-2	REV. 0
△			DATE 04-13-88	CONTRACT 845734
△			TAG NO. PX-540-033	
△			SPECIFICATION SECT. NO. 15649	
△			FOR CLIENT USE	
△			ORIG BY J. Janzen	CHK'D SSL
△			APPR'D	

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: H-2-123362-21 (SS 15649)

Service ZEOLITE SLURRY FEED PUMP	No. Motor Driven 1	PUMP MATERIALS
Pump Mfr.	Pump Tag No. PX-540-033	Casing 304L S.S.
Size & Type	ZEOLITE SLURRY FEED PUMP	Impeller
No. Stages		Internal Parts 304L S.S.
Serial No.	Motor Tag No. SAME	No. Pumps Req 1
	Motor Provided By MANUFACTURER	No. Turbine Driven NA

LIQUID	OPERATING CONDITIONS	SITE CONDITIONS
Name ZEOLITE SLURRY (5% WT)	Capacity (U.S. GPM): Normal 15 Rated 20.62	Temp. (°F): Max. Min.
Pumping Temperature (°F): Normal 77 Max. 77 Min.	Discharge Pressure (PSIG): 34.2	Rel. Humid. (%): Max. Min.
Specific Gravity: @ 77 °F = 1.027	Suction Pressure (PSIG): Max. Rated 0.5	Altitude (Feet):
Vapor Press. (PSIA): 0.46	Differential Pressure (PSI): 33.7	<input type="radio"/> Indoor <input type="radio"/> Heater <input type="radio"/> Roof
Viscosity (CP): @ 77 °F = 1.106	Differential Head (Feet): 75.9	<input type="radio"/> Outdoor <input type="radio"/> Unheated <input type="radio"/> Sun
Corrosion/Erosion Caused By:	NPSH Available (Feet): 32.1	Area Classification: 3
Remarks:	Hydraulic Power (HP): 0.406	Other:
		Remarks:

PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.:	Minimum Continuous Flow (GPM):	NPSH Required (Feet Water):
Speed (RPM):	Thermal Stable	3% Head Drop
Efficiency (%):	Max. Head Rated Imp. (Feet):	Suction Specified Speed:
Rated Power (BHP):	Max. Power Rated Imp. (BHP):	

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONNECTIONS	SIZE	TYPE
Suction					Drain		
Discharge					Vent		
Casing Mount: <input type="checkbox"/> Foot <input type="checkbox"/> Bracket			Impeller Diameter (Inches) Rated Max. Min.		Pressure Gage		
Centerline <input type="checkbox"/> Near Cntrl. <input type="checkbox"/> Inline			Impeller Type: <input type="checkbox"/> Open <input type="checkbox"/> Closed		Warm Up		
Casing Split: <input type="checkbox"/> Axial <input type="checkbox"/> Radial			Imp. Suction: <input type="checkbox"/> Single <input type="checkbox"/> Double		Balance Line		
Casing Type: <input type="checkbox"/> Diffuser <input type="checkbox"/> Staggered			Imp. Mount: <input type="checkbox"/> Btwn. Brgs <input type="checkbox"/> Overhung		Packing:		
<input type="checkbox"/> Single Volute <input type="checkbox"/> Double Volute			Rotation (Coupling End): <input type="checkbox"/> CW <input type="checkbox"/> CCW		Manufacturer		
Max. Allowable Pressure (PSIG): At 60°F			Bearing (Type/Number): Radial Thrust		Type		
At Nom. Pump Temp.			Coupling:		Size/No. Rings		
Hydro Test Pressure (PSIG):			Manufacturer		Mechanical Seal:		
Lubrication Type: <input type="checkbox"/> API 614			Type/Model		API Class code		
<input type="checkbox"/> Grease <input type="checkbox"/> Ring Oil <input type="checkbox"/> Oil Mist			Driver Half-Coupling Mounted By:		Manufacturer		
<input type="checkbox"/> Flood <input type="checkbox"/> Flinger <input type="checkbox"/> Pressure			<input type="radio"/> Pump Mfr. <input type="radio"/> Driver Mfr. <input type="radio"/> Purchaser		Model		
Remarks:					Mfr. Code		
					<input type="radio"/> Cartridge Type Required		
					Gland Type/Mat'l.:		
					Gland Plate Taps Required for:		

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☐ = By Purchaser ☐ = By Mfr./Purchaser ☐ Quench ☐ Flush ☐ Drain ☐ Vent

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ATTACHMENT A



FLUOR DANIEL

DATA SHEET

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

METERING PUMPS DIAPHRAGM TYPE

NO. △ △ △ △ △ △	BY DATE	REVISION	SHEET NO. P33B-DS-3	REV. 0
			DATE 10-21-92	CONTRACT 845734
			TAG NO. PX-540-038A/B PX-540-038C/D	
			SPECIFICATION SECT NO. 15649	
			FOR CLIENT USE	
			ORIG BY D. Francuz	CHK'D SSL

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: **P33B-15649**

Service ANTI-FOAM FEED PUMP	No. Motor Driven 4	PUMP MATERIALS
Pump Mfr. _____	Pump Tag No. PX-540-038A/B	Casing 304L S.S.
Size & Type _____	PX-540-038C/D	Impeller _____
No. Stages _____	ANTI-FOAM FEED PUMP	Internal Parts 304L S.S.
Serial No. _____	Motor Tag No. SAME	No. Pumps Req 4
	Motor Provided By MANUFACTURER	No. Turbine Driven _____

LIQUID	OPERATING CONDITIONS	SITE CONDITIONS
Name LIQUID IS SILICON-GLYCOL COMPOUND (10% IN WATER)	Capacity (U.S. GPM): Normal _____ Rated 0.5	Temp. (°F): Max. 104 Min. 60
Pumping Temperature (°F): Normal 77 Max. 104 Min. _____	Discharge Pressure (PSIG): 52.3	Rel. Humid. (%): Max. _____ Min. _____
Specific Gravity: @ 77 °F = 1.0	Suction Pressure (PSIG): Max. 3 Rated 1.28	Altitude (Feet): 714
Vapor Press. (PSIA): 0.46	Differential Pressure (PSI): 51	<input checked="" type="radio"/> Indoor <input checked="" type="radio"/> Heated <input type="radio"/> Roof
Viscosity (CP): @ 77 °F = 10	Differential Head (Feet): 118	<input type="radio"/> Outdoor <input type="radio"/> Unheated <input type="radio"/> Sun
Corrosion/Erosion Caused By: _____	NPSH Available (Feet): 30	Area Classification: 3
Remarks: _____	Hydraulic Power (HP): 0.015	Other: _____
		Remarks: _____

PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.: _____	Minimum Continuous Flow (GPM): _____	NPSH Required (Feet Water): _____
Speed (RPM): _____	Thermal _____ Stable _____	3% Head Drop _____
Efficiency (%): _____	Max. Head Rated Imp. (Feet): _____	Suction Specified Speed: _____
Rated Power (BHP): _____	Max. Power Rated Imp. (BHP): _____	

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONNECTIONS	SIZE	TYPE
Suction	1/2"	NPT (F)			Drain		
Discharge	1/2"	NPT (F)			Vent		
Casing Mount: <input type="checkbox"/> Foot <input type="checkbox"/> Bracket Centerline <input type="checkbox"/> Near Cntrl. <input type="checkbox"/> Inline Casing Split: <input type="checkbox"/> Axial <input type="checkbox"/> Radial Casing Type: <input type="checkbox"/> Diffuser <input type="checkbox"/> Staggered <input type="checkbox"/> Single Volute <input type="checkbox"/> Double Volute Max. Allowable Pressure (PSIG): At 60°F _____ At Nom. Pump Temp. _____ Hydro Test Pressure (PSIG): _____ Lubrication Type: <input type="checkbox"/> API 614 <input type="checkbox"/> Grease <input type="checkbox"/> Ring Oil <input type="checkbox"/> Oil Mist <input type="checkbox"/> Flood <input type="checkbox"/> Flinger <input type="checkbox"/> Pressure Remarks: _____					Impeller Diameter (Inches) Rated _____ Max. _____ Min. _____ Impeller Type: <input type="checkbox"/> Open <input type="checkbox"/> Closed Imp. Suction: <input type="checkbox"/> Single <input type="checkbox"/> Double Imp. Mount: <input type="checkbox"/> Btwn. Brgs <input type="checkbox"/> Overhung Rotation (Coupling End): <input type="checkbox"/> CW <input type="checkbox"/> CCW Bearing (Type/Number): Radial _____ Thrust _____ Coupling: Manufacturer _____ Type/Model _____ Driver Half-Coupling Mounted By: <input type="radio"/> Pump Mfr. <input type="radio"/> Driver Mfr. <input type="radio"/> Purchaser		
					Packing:		
					Manufacturer _____		
					Type _____		
					Size/No. Rings _____		
					Mechanical Seal:		
					API Class code _____		
					Manufacturer _____		
					Model _____		
					Mfr. Code _____		
					<input type="radio"/> Cartridge Type Required		
					Gland Type/Mat'l.: _____		
					Gland Plate Taps Required for:		

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105/OS/101/204/84571901.MIS/WPS1-012593

☐ = By Purchaser ☐ = By Mfr./Purchaser ☐ Quench ☐ Flush ☐ Drain ☐ Vent

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ATTACHMENT B
EQUIPMENT MAXIMUM ENVELOPE AND
MODEL NUMBER OR EQUAL

TAG NUMBER	MODEL NUMBER*	MAXIMUM ENVELOPE (inches)		
		LENGTH	WIDTH	HEIGHT
PX-540-031	American Lewa EH 140-85 Simplex	33.5	32	25
PX-540-033	American Lewa EH 140-100 Duplex	33.5	32	25
PX-540-038A	Milton Roy-Centrac 1" Plunger	14	21	25
PX-540-038B	Milton Roy-Centrac 1" Plunger	14	21	25
PX-540-038C	Milton Roy-Centrac 1" Plunger	14	21	25
PX-540-038D	Milton Roy-Centrac 1" Plunger	14	21	25

*Equipment shall be of this model number or equal.

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U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 15820
VACUUM BLOWERS
B-595-P-P33B-15820

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA YES NO X
QUALITY LEVEL I II X
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

J. J. Ichkhan
J. J. Ichkhan, Mechanical Eng.

CHECKER:

D. A. Buzzelli
D. A. Buzzelli, Lead Disc. Checker

APPROVED BY:

R. B. Erickson
C. J. Divona Lead Discipline Engineer

1-26-93
Date

SECTION 15820
VACUUM BLOWERS

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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>
A	DATA SHEET
B	EQUIPMENT MAXIMUM ENVELOPE AND MODEL NUMBER OR EQUAL

9413202.0762

**SECTION 15820
VACUUM BLOWERS**

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the technical requirements for the design, materials, fabrication, inspection and testing of vacuum blowers.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AIR MOVEMENT CONTROL ASSOCIATION, INC. (AMCA)

AMCA Publication 210 1985 Laboratory Methods of Testing Fans
for Rating

AMCA Publication 300 1985 (Rev. 87) Reverberant Room Method
for Sound Testing of Fans

AMERICAN GEAR MANUFACTURERS ASSOCIATION (AGMA)

AGMA 2000-A 1988 Gear Classification and Inspection
Handbook: Tolerances and Measuring
Methods for Unassembled Spur and
Helical Gears (Including Metric
Equivalents)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B16.5 1986 Pipe Flanges and Flanged Fittings

ANSI B36.19M 1985 Stainless Steel Pipe (Revision of
ANSI B36.16 - 1976)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A216/A216M 1989 Standard Specification for Steel
Castings, Carbon, Suitable for Fusion
Welding for High Temperature Service

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME PTC-9 1970 (Rev. 85) Displacement
Compressors, Vacuum Pumps and Blowers

9413202.0763

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 1990 Structural Welding Code Steel,
12th Edition

ANTI-FRICTION BEARING MANUFACTURERS ASSOCIATION (AFBMA)

AFBMA 9 1990 Load Ratings and Fatigue Life for
Ball Bearings

AFBMA 11 1990 Load Ratings and Fatigue Life for
Roller Bearings

COMPRESSED AIR AND GAS INSTITUTE (CAGI)

CAGI PNEUROP S5.1 1971 Test Code for the Measurement of
Sound from Pneumatic Equipment,
1st Edition

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

OSHA Standard 1978 Guards for Rotating Equipment
Instruction 1-12.14

1.3 RELATED REQUIREMENTS

Specification Section 01730 Operation and Maintenance Data

Specification Section 15196 Identification and Tagging Methods
for Mechanical Equipment

Specification Section 16150 Motors - Induction for General
Service

1.4 DEFINITIONS

FAT - Factory Acceptance Test

TEFC - Totally Enclosed Fan Cooled

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and
Data Requirements section of the Order/Subcontract.

1.6.1 Drawings shall be submitted for Buyer approval.

- 1.6.1.1 A. Certified dimensional outline drawings. These drawings shall indicate dimensions, shipping weights, operating weights, clearances to be maintained, size and location of all connections, lifting supports, materials of construction and corrosion allowances. They shall include equipment support data and equipment performance data (this includes performance curves). Drawings which include the base frame shall depict base plate thickness and bolt hole sizes and location for anchor bolts.
- B. Sectional drawings. These drawings shall show inside arrangement, construction and details for each component.
- C. Allowable loads on the blower discharge nozzles and suction nozzles shall be furnished.

All drawings shall include a detailed Bill of Materials. This shall list manufacturer, type and rating of all component parts or assemblies.

- 1.6.2 Receiving, storage and handling instructions to include inspection and checkout tests.
- 1.6.3 Manufacturer's Installation Instructions.
- 1.6.4 Technical Data shall be submitted for Buyer approval.
- 1.6.4.1 Design Calculations - Seller shall provide an engineering design analysis with supporting calculations used to establish horsepower requirements, shaft sizes, bearing loads and operating characteristics. These calculations shall be complete and in sufficient detail to permit second-party review.
- 1.6.4.2 Descriptive Literature - Descriptive literature shall be provided by Seller. This literature shall include equipment ratings, model numbers, and technical descriptions.
- 1.6.4.3 Data Sheets
- A. Seller shall complete Data Sheet P33B-DS-1 (Attachment A) and submit for the furnished equipment.
- 1.6.4.4 Vacuum Blower Performance Curves
- Vacuum blower performance curves shall be submitted. These curves shall include blower brake horsepower, efficiency, pressure drop, slip, viscosity and specific gravity corrections.
- 1.6.4.5 Factory Acceptance Tests (FATs) as defined in Paragraph 2.2.11.

1.6.5 Spare Parts List

A list of recommended spare parts for one (1) year's routine operation shall be submitted. The spare parts list shall include sufficient data to permit procurement either from original manufacturer or any subsupplier.

1.6.6 Installation, Operation and Maintenance Manuals

Seller shall submit operation and maintenance manuals. These shall cover the vacuum blowers furnished in accordance with this specification section. These manuals shall fully detail sequences of disassembly, repair, adjustment, reassembly, lubrication and troubleshooting. Troubleshooting sections shall include fault trees to guide both mechanical and electrical diagnostics. The manuals shall include reduced-size 11X17 copies of any assembly drawing, subassembly drawing or parts list needed for routine maintenance and overhaul. This data shall be submitted in accordance with Specification Section 01730. Complete installation manuals shall also be submitted.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

- | | |
|-------------------------------|--------------------------|
| A. Site Elevation | 714 feet above sea level |
| B. Barometric Pressure | 14.3 psia |
| C. Outside Design Temperature | |
| 1) Maximum Temperature | 110°F |
| 2) Minimum Temperature | -20°F |
| 3) Wet Bulb Temperature | 68°F |

1.8.2 Operating Environment

- | | |
|------------------------|----------------|
| A. Normal Temperature | 60° to 104°F |
| B. Maximum Temperature | 104°F |
| C. Relative Humidity | Not Controlled |

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 General Requirements

Vacuum blower assemblies shall be furnished by a manufacturer normally engaged in the production of rotary vacuum blowers. Vacuum blowers furnished in accordance with this specification section shall be standard rotary vacuum blowers, skid-mounted, designed and constructed in accordance with the requirements of ASME PTC-9.

All exposed moving parts shall have heavy-duty removable guards provided in accordance with OSHA Standard Instruction 1-12.14.

2.1.2 Vacuum Blower Casing

Vacuum blower casing shall be carbon steel in accordance with ASTM A216/A216M. The casing and discharge nozzles shall be cast in one piece. Casing shall be designed to withstand a hydrostatic pressure of not less than 1.5 times the blower design pressure.

2.1.3 Impeller

Impeller shall be cast steel in accordance with ASTM A216/A216M. The impeller shall be dynamically balanced in accordance with manufacturer's standard practice.

2.1.4 Strainer

The blower intake shall be protected with a slotted intake strainer. The strainer shall be cast steel in accordance with ASTM A216/A216M. It shall have an effective free area sufficient to prevent pressure drop and efficiency degradation. Strainer shall have a free area not less than four times the cross-sectional area of the suction casing. The strainer shall be 99 percent efficient on 10 microns particles and larger.

2.1.5 Vacuum Blower Shaft

Vacuum blower shaft shall be carbon steel. Shafts shall be ground and polished. Wearing surfaces at shaft bearings shall be hardened. The shaft's mechanical properties and diameter shall ensure that whip, deflection or vibration shall not be of sufficient magnitude to impose loads greater than design on the specified shaft bearings under normal operating conditions. A means of clearance adjustment between impeller and casing inner surface shall be supplied from the blower exterior.

2.1.6 Bearings and Lubrication

Ball or roller bearings shall be furnished. These bearings shall have full provision for the imposed mechanical radial and thrust loads. Bearings shall be sealed and grease-lubricated. They shall have an L-10 rating of 100,000 hours service life calculated in accordance both with AFBMA 9 and AFBMA 11.

2.1.7 Flexible Couplings

A carbon steel flexible coupling in accordance with ASTM A216/A216M shall be utilized to connect the vacuum blower shaft to the motor shaft. It shall not transmit vibration or end thrust. Under normal operating conditions the coupling shall permit misalignment up to 4 degrees, maximum.

Vacuum blower manufacturer shall mount blower and motor half couplings. Couplings shall be rated for not less than 150 percent of motor nameplate horsepower at design rpm. All metal flexible couplings shall be keyed to both shafts.

2.1.8 Reduction Gears

Reduction gears for the vacuum blower shall be manufactured in accordance with AGMA 2000-A.

2.1.9 Silencers

The vacuum blowers supplied in accordance with this specification section shall be equipped with silencers. These silencers shall be in accordance with manufacturer's standards. The jet silencer shall be mounted on the respective vacuum blower. The discharge silencer shall have three support legs. Material used to fabricate silencers shall be carbon steel in accordance with ASTM A216/A216M.

- 2.1.10 The vacuum blower skid shall have a minimum of six (6) 15/16 inch diameter bolt holes for 3/4 inch diameter bolts. The discharge silencer shall have a minimum of three support legs with one (1) 15/16 inch diameter bolt hole per leg for 3/4 inch diameter bolts.

2.2 FABRICATION AND MANUFACTURE

2.2.1 General Requirements

The vacuum blower operating point shall be within 10 percent of the peak efficiency on the blower performance curve. At design conditions and at maximum horsepower along the blower curve, the horsepower requirements shall not exceed the motor's nominal rating as shown on the nameplate (excluding service factor). All rotating parts of the assembled equipment shall operate throughout

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the required range without excessive vibration, as shown in Paragraph 2.2.5, or noise. The noise level shall not exceed 85 dB at 3 feet peripheral around the blower assembly.

2.2.2 Vacuum Blower Casing

The vacuum blower casing shall be designed both for the maximum discharge pressure at discharge temperature and hydrostatic test pressure at ambient temperature as shown on Data Sheet P33B-DS-1 (Attachment A).

2.2.3 Materials

Castings shall be sound. No shrink, blow holes, scale, blisters or other defects shall be permitted. Surfaces shall be cleaned by Seller's standard methods. All casting burrs shall be filed or ground flush with the casting surface. The use of plastic or cement compounds to repair leaks and defects in pressure casings shall not be permitted.

2.2.4 Bearings

Bearings shall be sized to take the thrust loads of 150 percent of rated capacity at maximum speed.

2.2.5 Balance and Vibration

The rotating assembly of shaft and blower wheel shall be both statically and dynamically balanced in accordance with manufacturer's standard practice before assembly into the housing. The fan shall be given a balance test both after assembly and after installation in the field. The magnitude of vibration of the installed fan shall not exceed the displacement shown in the following table. Measurements shall be taken on the top side of each bearing at two points on the equipment housing and the base at 90° apart. The measurement points shall be permanently marked for future use.

REVOLUTIONS PER MINUTE (RPM)	DISPLACEMENT (MILS)	VELOCITY (IN/SEC-PEAK)
900	0.20	0.0098
1,200	0.15	0.0098
1,800	0.10	0.0098
3,600	0.05	0.0098

2.2.6 Motor

Motors shall be induction type. They shall be totally enclosed fan cooled (TEFC), squirrel-cage type. They shall have normal starting and breakdown torque. Motors shall be in accordance with Specification Section 16150.

2.2.7 Coatings

Vacuum blower motor, silencer and exposed parts of the support frame for the vacuum blower shall be primed and painted in accordance with manufacturer's standard. Stainless steel, plastics and elastomers shall not be painted unless specified otherwise.

2.2.8 Flanges

Flanges supplied with the vacuum blower shall be in accordance with ANSI B16.5.

2.2.9 Welding

Welding of the skid-mounted vacuum blower shall be in accordance with AWS D1.1.

2.2.10 Piping

All piping that connects vacuum blower components shall be in accordance with ANSI B36.19M.

2.2.11 Factory Acceptance Tests (FATs)

- A. Seller shall shop test the unit to verify blower performance in accordance with ASME PTC-9. A detailed shop testing procedure shall be submitted for Buyer approval before testing begins. Buyer shall be notified in advance of all source testing. Buyer reserves the right to witness all tests (FATs).
- B. Vacuum blower shall be tested at the factory to provide detailed performance data and demonstrate conformance to this specification section, AMCA Publication 210, AMCA Publication 300 and CAGI PNEUROP S5.1. The vacuum blower shall be hydrostatically tested for a period of not less than 30 minutes. The test pressure shall be not less than one and one-half times the head capabilities of the maximum diameter impeller for the casing at shutoff. Vacuum blower casing shall be free of leaks at the test pressure. No visually-detectable leakage shall occur at any joint during the test.

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- C. Seller shall furnish certified shop test curves and FAT reports. These shall show the blower discharge capacity, efficiency and brake horsepower.

2.2.12 Envelope

The maximum available envelope for the vacuum blower equipment and the model number or equal are shown in Attachment B.

2.3 LABELING

Labeling shall be in accordance with Specification Section 15196, Paragraph 2.2.2, Type 6. Such labeling shall be in addition to the manufacturer's identification plate.

An arrow shall indicate the blower's direction of rotation. This arrow shall be integrally-cast or otherwise permanently attached at the vacuum blower's drive end.

2.4 PACKAGING

- 2.4.1 Preparation for shipment and packing shall be in accordance with Seller's standards. At minimum, they shall provide protection against corrosion and damage during normal handling, shipping and storage.
- 2.4.2 Machined surfaces, threads, bearings and bearing housings shall be protected during shipment by application of grease or other suitable rust-inhibiting compound.
- 2.4.3 Flanged openings shall be covered with wood or plastic protectors. Protectors shall be installed with not less than four (4) full diameter steel bolts and nuts.
- 2.4.4 Threaded connections and tapped holes shall be capped or plugged. Compatible materials shall be used to prevent thread damage.
- 2.4.5 Vacuum blower unit shall be shipped fully assembled.
- 2.4.6 Bracing, supports and rigging connections shall be provided to prevent damage during shipment, lifting and unloading.
- 2.4.7 Separate or loose parts shall be completely boxed. The box shall then be attached to the main item to be shipped as a unit.

All shipping boxes shall be identified by Seller's order number, equipment number and equipment description.

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U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

Rev. 0

PART 3 EXECUTION

(Not Used)

END OF SECTION

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SERVICE OF UNIT 2
NO UNITS REQ'D

NUMBER OF STAGES	_____	_____	_____	_____	_____
STAGE NO	_____	_____	_____	_____	_____
GAS COMPRESSED	<u>AIR</u>	_____	_____	_____	_____
CORROSIVE DUE TO	_____	_____	_____	_____	_____
HUMIDITY (REL)	<u>100%</u>	_____	_____	_____	_____
MOL WT AT INLET (DRY)	<u>29</u>	_____	_____	_____	_____
C _p /C _v VALUE AT SUCTION	_____	_____	_____	_____	_____
INLET TEMP (DEG F)	<u>70</u>	_____	_____	_____	_____
INLET PRESS (PSIA)	<u>4.6</u>	_____	● SILENCER INLET	_____	_____
DISCHARGE TEMP (DEG F)	_____	_____	BY VENDOR	_____	_____
DISCHARGE PRESS (PSIA)	<u>15.0</u>	_____	● SILENCER OUTLET	_____	_____
CAPACITY - NORMAL	_____	_____	_____	_____	_____
LB PER HR (DRY)	<u>3392</u>	_____	_____	_____	_____
ACFM AT INLET (DRY)	<u>2520</u>	_____	_____	_____	_____
ACFM AT DISCHARGE	_____	_____	BY VENDOR	_____	_____
BAKE HORSEPOWER AT RATED CONDITIONS	_____	_____	BY VENDOR	_____	_____

VACUUM PUMP MFR SHALL FURNISH

☒ VIBRATION ISOLATORS FOR ☒ INLET ☒ OUTLET ☒ BASEPLATE ☐ OTHER

☐ (CLOSED/OPEN) SYSTEM OIL DEMISTER NO REQD _____ IN (SERIES/PARALLEL)
TYPE _____ P (MM HG abs) _____

☒ INSTRUMENT PANEL

☐ COOLING WATER PIPING CONNECTIONS: SIZE _____ RATING _____

☒ LUBE OIL PIPING CONNECTIONS: SIZE _____ RATING _____

☐ SEAL OIL DRAIN CONNECTIONS: SIZE _____ RATING _____

☐ SEAL OIL BACK-FLOW TRAP

☒ AUTOMATIC ☐ MANUAL ☒ BY-PASS CONTROL

☐ OIL DEMISTER CONNECTIONS INLET TYPE AND SIZE _____ RATING _____
OUTLET TYPE AND SIZE _____ RATING _____

REMARKS: _____

REMARKS & SKETCHES:
NOTES: (1) THE SYSTEM INCLUDES INLET AND OUTLET SILENCERS.
(2) 150 HP MOTOR

Rev. 0

ATTACHMENT B
EQUIPMENT MAXIMUM ENVELOPE AND
MODEL NUMBER OR EQUAL

TAG NUMBER	MODEL NUMBER*	MAXIMUM ENVELOPE WITH EXHAUST SILENCER (inches)		
		LENGTH	WIDTH	HEIGHT
VP-620-001VA	Roots Model 1016DVJ	176.50	54.5	102
VP-620-001VB	Roots Model 1016DVJ	176.50	54.5	102

*Equipment shall be of this model number or equal.

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U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 15821
CENTRIFUGAL BLOWERS
B-595-P-P33B-15821

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA YES NO X
QUALITY LEVEL I II X
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

J. J. Ichkhan 1-26-93
J. J. Ichkhan, Mechanical Engineer Date

CHECKER:

D. A. Buzzelli 1-26-93
D. A. Buzzelli, Lead Disc. Checker Date

APPROVED BY:

R. B. Erickson
C. J. Divona Lead Discipline Engineer

1-26-93
Date

Rev. 0

SECTION 15821
CENTRIFUGAL BLOWERS
B-595-P-P33B-15821

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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>
A	DATA SHEET
B	EQUIPMENT MAXIMUM ENVELOPE AND MODEL NUMBER OR EQUAL

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**SECTION 15821
CENTRIFUGAL BLOWERS**

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the technical requirements for the design, fabrication, inspection and testing of the centrifugal blowers for the cold feed vent system.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

ARI 670 1990 Fans and Blowers

AIR MOVING AND CONDITIONING ASSOCIATION, INC. (AMCA)

AMCA Publication 210 1985 Testing

AMCA Publication 300 1985 Sound Power Levels

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B16.5 1988 Pipe Flanges and Flanged Fittings

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM 480/A480M 1991 (Rev. 91) Standard Specification for General Requirements for Flat-Rolled Stainless and Heat Resisting Steel Plate, Sheet and Strip

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME PTC 11 1984 (Rev. 90) Fans

ANTIFRICTION BEARING MANUFACTURERS ASSOCIATION (AFBMA)

AFBMA 9 1990 Edition - Load Ratings and Fatigue Life for Ball Bearings

AFBMA 11 1990 Edition - Load Ratings and Fatigue Life for Roller Bearings

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INSTRUMENT SOCIETY OF AMERICA (ISA)

ISA S20 1981 Specification Forms for Process
Measurement and Control Instruments
Primary Elements and Control Values

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

OSHA Standard 1978 Guards for Rotating Equipment
Instruction 1-12.14

1.3 **RELATED REQUIREMENTS**

Specification Section 01730 Operation and Maintenance Data
Specification Section 05066 Welding Specialty Equipment
Specification Section 15196 Identification and Tagging Methods
for Mechanical Equipment
Specification Section 16150 Motors - Induction for General
Service

1.4 **DEFINITIONS**

FAT - Factory Acceptance Test
RPM - Revolutions per Minute
TEFC - Totally Enclosed Fan Cooled

1.5 **SYSTEM DESCRIPTION**

(Not Used)

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and
Data Requirements section of the Order/Subcontract.

1.6.1 Drawings

- 1.6.1.1 A. Certified dimensional drawings shall be submitted for Buyer
approval. These drawings shall include dimensions, shipping
weights, operating weights and clearances to be maintained.
They shall also show design temperatures and pressures,
operating temperatures and pressures, size and location of
all connections, lifting supports and materials of construc-
tion. Drawings which include the base frame shall include

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base plate thickness at the foundation bolts, location of anchor bolts and size of control panel fasteners.

- B. Sectional drawings. These drawings shall show inside arrangement construction and details for each component.
- C. The allowable loads on both the blower discharge nozzle and suction nozzle shall be furnished.

All drawings shall include a detailed bill of materials. This bill shall list the manufacturer, type and ratings of all component parts, or assemblies.

1.6.2 Technical Data

- 1.6.2.1 Design Calculations - Engineering design analysis with supporting calculations used to establish connected horsepower requirements, shaft sizes, bearing loads, nozzle loading and operating characteristics. Calculations shall be complete and in sufficient detail to permit a second-party review.

1.6.2.2 Descriptive Literature

Descriptive literature. This shall include equipment ratings, model numbers, operating characteristics and technical descriptions.

1.6.2.3 Data Sheets

- A. Seller shall submit complete data sheets for the furnished equipment. These data sheets shall reflect the design parameters in Data Sheet P33B-DS-1 (Attachment A).
- B. Complete instrumentation data sheets, ISA S20 specification forms for process measurement and control instruments, primary elements and control valves.

1.6.2.4 Centrifugal Fan Performance Curves

Fan performance curves shall be provided for Buyer approval. These curves shall include fan brake horsepower, efficiency and applicable corrective factors.

- 1.6.2.5 Seller shall submit reports of Factory Acceptance Tests (FATs) as defined in Paragraph 2.4.

1.6.3 Spare Parts List

A list of recommended spare parts for one (1) year's routine operation shall be supplied. The spare parts list shall include sufficient data to permit procurement from the original manufacturer or any subsupplier.

1.6.4 Installation, Operation and Maintenance Manuals

Seller shall provide operation and maintenance manuals. These shall cover the centrifugal fans furnished in accordance with this specification section. The manuals shall fully detail sequences of disassembly, repair, adjustment, reassembly, lubrication and troubleshooting. Troubleshooting sections shall include fault trees to guide both mechanical and electrical diagnostics. This data shall be submitted in accordance with Specification Section 01730. Complete installation manuals shall also be submitted.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

- | | | |
|----|--------------------------------|--------------------------|
| A. | Site Elevation | 714 feet above sea level |
| B. | Barometric Pressure | 14.3 psia |
| C. | Outside Design Temperature | |
| | 1) Maximum Design Temperature | 110°F |
| | 2) Minimum Temperature | -20°F |
| | 3) Wet Bulb Design Temperature | 68°F |
| D. | Operating Environment | |
| | 1) Normal Temperature | 60°F to 104°F |
| | 2) Maximum Temperature | 104°F |
| | 3) Relative Humidity | Not controlled |

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 General Requirements

Centrifugal blowers shall be furnished by a manufacturer normally engaged in the production of industrial centrifugal fans. Fans furnished in accordance with this specification section shall be centrifugal fans designed and constructed in accordance both with ARI 670 and ASME PTC-11 for the intended service. The fan blower selected shall operate at no more than 5 percent divergence from the maximum efficiency point when operating at design air flow and static pressures as defined on Data Sheet P33B-DS-1 (Attachment A).

2.1.2 Materials

The material for the fabricated fan and support base shall be stainless steel in accordance with ASTM 480/A480M.

2.1.3 Air Flow Control

The air flow control shall be made with variable inlet vanes. The inlet vanes shall be designed to permit capacity variation from full capacity to less than 30 percent flow without deviation from characteristic performance curve. The fan unit shall consist of the inlet vanes, control unit and all necessary linkage and shafts.

2.2 FABRICATION AND MANUFACTURE

2.2.1 The centrifugal blower operating point shall be within 10 percent of the peak efficiency on the blower performance curve. The horsepower requirements shall not exceed the nominal rating of the motor as shown on the nameplate (excluding service factor).

All rotating parts of the assembled equipment shall operate throughout the required range without excessive vibration, in accordance with Paragraph 2.2.2, or noise. The noise level shall not exceed 85 dB at 3 feet peripheral around the blower assembly.

2.2.2 Balance and Vibration

The rotating assembly of shaft and blower wheel shall be both statically and dynamically balanced in accordance with manufacturer's standard practice before assembly into the housing. The fan shall be given a balance test both after assembly and after installation in the field. The magnitude of vibration of the installed fan shall not exceed the displacement shown in the

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following table. Measurements shall be taken on the top side of each bearing at two points on the equipment housing and the base at 90° apart. The measurement points shall be permanently marked for future use.

Revolutions Per Minute (RPM)	Displacement (mils)	Velocity (in/sec-peak)
900	0.20	0.0098
1,200	0.15	0.0098
1,800	0.10	0.0098
3,600	0.05	0.0098

2.2.3 Blower Housing

Blowers larger than 40-inch wheel diameter shall have a maximum RPM of 850. Wobble and lobe shall be $\pm 1/8$ inch of wheel dimensions. The fan housing, including inlet box where required, shall be constructed for the cutoff pressure of the blower. Housing shall have round bell-mouth inlet. The housing shall be adequately reinforced to minimize vibration and panel pulsation. Access doors and inlet and outlet connections shall be flanged and drilled for bolting and adequately rigid for gasket compression. All welding shall be continuous and in accordance with Specification Section 05066.

2.2.4 Blower Base

Structural steel base shall be provided for the blower except those with inlet box. Base shall accommodate blower housing, motor, V-belt drive or flexible coupling and outboard bearings. Bearing pedestal and soleplate shall be provided for the blower with inlet box.

2.2.5 Bearings

Bearings on blowers furnished in accordance with this specification section shall be of one of the following types:

- A. Antifriction, self-aligning, double-row spherical roller bearings. These bearings shall have split-pillow block housing.
- B. Ball bearing manufactured in accordance with blower manufacturer's standard.

The bearings shall have accessible connections for lubrication with either oil or grease. The bearing housing shall have either grease or oil seals as appropriate. Bearings shall be designed for not less than 100,000 hours service life in accordance both with AFBMA 9 and AFBMA 11.

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2.2.6 Seals

The linkage and shaft combination shall penetrate the inlet box or blower housing with a seal. The member that penetrates the box or housing shall be a cylindrical shaft. Only rotational motion around the centerline of the shaft shall be required at the point of penetration to move the vanes through the maximum operating range. The seal and the affected housing or box shall maintain the leak test requirements of Paragraph 2.4 under both static and dynamic conditions. No additional temporary sealing shall be used at the shaft during tests.

2.2.7 Driver

The driver shall be an electrical motor provided in accordance both with Specification Section 16150 and this specification section.

The electric motor shall be integral, foot mounted, totally enclosed fan cooled (TEFC), squirrel cage induction motor. It shall have normal across the line starting and breakdown torque.

2.2.8 Belt or Coupling Guards

Guards shall be provided on all exposed moving parts. Guards shall be in accordance with OSHA Standard Instruction 1-12.14.

2.2.9 Welding

All blower unit assembly welding requirements shall be in accordance with Specification Section 05066.

2.2.10 The centrifugal blower base plate shall be anchored with a minimum of four 1/2 inch diameter steel anchor bolts. Bolt holes shall be 11/16 inch diameter.

2.2.11 Design Envelope

Maximum size envelope and model number or equal are shown in Attachment B.

2.2.12 Flanges and flanged connections shall be in accordance with ANSI B16.5.

2.3 LABELING

Labeling and tagging shall be in accordance with Specification Section 15196, Paragraph 2.2.2, Type 6. This shall be in addition to the manufacturer's identification plate.

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An arrow shall indicate centrifugal blower rotating direction. The arrow shall be located on the centrifugal blower drive end. It shall be integrally-cast or otherwise permanently attached.

2.4 INSPECTION AND TESTING

2.4.1 Factory Acceptance Tests (FATs)

Seller shall shop-test the centrifugal blower unit to verify performance in accordance with AMCA Publications 210 and 300 and ASME PTC 11. The tests shall include positive pressure test, negative pressure test and shaft seal leak test. Buyer shall be notified in advance of all source testing and shall be allowed to witness all tests (FATs).

2.5 PACKAGING

Packaging and preparation for shipment shall be in accordance with Seller's standards. At minimum, protection shall be provided against corrosion and damage during normal handling, shipping and storage. Minimum preparation shall include the requirements listed below.

2.5.1 Machined surfaces, threads, bearings and bearing housings shall be protected during shipment by application of grease or other suitable rust-inhibiting compound.

2.5.2 Flanged openings shall be covered with wood or plastic protectors. Protectors shall be installed with not less than four (4) full diameter steel bolts and nuts.

2.5.3 Threaded connections and tapped holes shall be capped or plugged. Compatible materials shall be used to prevent thread damage.

2.5.4 Centrifugal Blower Unit Assemblies shall be shipped fully assembled on baseplate.

2.5.5 Bracing, supports and rigging connections shall be provided to prevent damage during shipment, lifting and unloading.

2.5.6 Separate or loose parts shall be boxed. The box shall be attached to the main item to be shipped as a unit.

All shipping containers shall be identified by Seller's order number, equipment number and equipment description.

PART 3 EXECUTION

(Not Used)

END OF SECTION

9413202.0784

ATTACHMENT A



FLUOR DANIEL

DATA SHEET

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FANS AND BLOWERS

NO.	REVISION	SHEET NO. P33B-DS-1	REV. 0
△		DATE 06-06-90	CONTRACT 845734
△		ITEM NO. BL-560-001A & BL-560-001B	
△		SPECIFICATION SECT NO. 15821	
△		FOR CLIENT USE	
△		DRG BY M. Desai	CHK'D KJM
△		APPR'D	

VENDOR MUST FURNISH ALL PERTINENT DATA FOR THIS SPECIFICATION SHEET BEFORE RETURNING

CUSTOMER HMWP	SERVICE Cold Feed Vent Blower	SITE Richland, WA
NO. REQUIRED 2	DRIVE Motor	MANUFACTURER
GAS HANDLED Air	MOLECULAR WEIGHT 29	CORROSIVES

DATA BY PURCHASER				DATA BY VENDOR			
OPERATING CONDITIONS	1.	2.	3.				
<input type="checkbox"/> CAPACITY (SCFM)*				TYPE FAN: (CENTRIFUGAL <input checked="" type="checkbox"/>) (VANEAXIAL <input type="checkbox"/>)			
<input type="checkbox"/> CAPACITY ICFM				(TUBE AXIAL <input type="checkbox"/>) (PROPELLER <input type="checkbox"/>)			
<input type="checkbox"/> SPECIFIC GRAVITY (AIR = 1)				TYPE BLADES: (BACKWARD CURVED <input checked="" type="checkbox"/>) (RADIAL <input type="checkbox"/>)			
<input type="checkbox"/> BAROMETER (PSIA)				(FWD CURVED <input type="checkbox"/>) (AIR FOIL <input type="checkbox"/>) (FLAT <input type="checkbox"/>)			
<input type="checkbox"/> EVEL ABOVE SEAL LEVEL (FT)				CONSTRUCTION DETAILS:			
<input type="checkbox"/> RELATIVE HUMIDITY (%)				DESCRIPTION (SISW <input type="checkbox"/>) (DIDW <input type="checkbox"/>)			
<input type="checkbox"/> TEMP INLET NORMAL (°F)				CLASS (I <input type="checkbox"/>) (II <input type="checkbox"/>) (III <input type="checkbox"/>) (IV <input type="checkbox"/>)			
<input type="checkbox"/> TEMP INLET MIN (°F)				AGREEMENT (1 <input type="checkbox"/>) (2 <input type="checkbox"/>) (3 <input type="checkbox"/>) (4 <input type="checkbox"/>) (5 <input type="checkbox"/>) (6 <input type="checkbox"/>) (7 <input type="checkbox"/>) (8 <input type="checkbox"/>) (9 <input type="checkbox"/>)			
<input type="checkbox"/> DENSITY OF MIXTURE LBS/FT ³				MOTOR LOCATION (W <input type="checkbox"/>) (X <input type="checkbox"/>) (Y <input type="checkbox"/>) (Z <input type="checkbox"/>)			
<input type="checkbox"/> PRESS DIFFERENTIAL (H ₂ O)				WHEEL: (CAST <input type="checkbox"/>) (LAMINATED <input type="checkbox"/>) (RVETED <input type="checkbox"/>) (WELDED <input type="checkbox"/>)			
<input type="checkbox"/> SPEED (RPM)				SHAFT: (DIA AT WHEEL <input type="checkbox"/>) (DIA AT BRGS <input type="checkbox"/>)			
<input type="checkbox"/> WHEEL TIP VELOCITY (FPM)				(SPAN <input type="checkbox"/>) (OVERHANG <input type="checkbox"/>)			
<input type="checkbox"/> BHP (INCL LOSSES)				BEARINGS: (INTERNAL <input type="checkbox"/>) (EXTERNAL <input type="checkbox"/>)			
<input type="checkbox"/> WATER RATE (#HP/HR)				RADIAL (BALL <input type="checkbox"/>) (ROLLER <input type="checkbox"/>) (SLEEVE <input type="checkbox"/>)			
<input type="checkbox"/> MAX CAP (CFM @ INLET)				THRUST			
<input type="checkbox"/> SURGE PT (MIN CFM)				SEALS: TYPE: _____			
<input type="checkbox"/> FAN: 1ST CRITICAL				ROTATION FACING COUPLING (CW <input type="checkbox"/>) (CCW <input type="checkbox"/>)			
<input type="checkbox"/> CONTROL:				MATERIALS OF CONSTRUCTION 304L SS			
OUTLET DAMPERS (STD) (STREAMFLOW)				HOUSING WALL THICKNESS _____			
VARIABLE INLET VANES (MANUAL) (X AUTOMATIC)				BLADES BLADE THICKNESS _____			
VARIABLE SPEED DRIVE (YES) (NO)				HUB _____			
VARIABLE PITCH BLADES (MANUAL) (AUTOMATIC)				SHAFT _____			
<input type="checkbox"/> CONTROL POWER: _____ VOLTS _____ PH _____ HZ				SHAFT SLEEVES _____			
ELECT EQUIP HAZARD CLASS _____				OTHER _____			
<input type="checkbox"/> DRIVER: (MOTOR <input checked="" type="checkbox"/>) (TURBINE <input type="checkbox"/>)				CONNECTIONS			
<input type="checkbox"/> MAKE _____ <input type="checkbox"/> TYPE _____				SIZE			
<input type="checkbox"/> RATED _____ <input type="checkbox"/> RPM _____				RATING			
<input type="checkbox"/> WEIGHT _____				ORIENTATION			
<input type="checkbox"/> COUPLING: (YES <input type="checkbox"/>) (NO <input type="checkbox"/>)				OUTLET 6" 150#			
<input type="checkbox"/> MAKE _____ <input type="checkbox"/> TYPE _____				OUTLET 6" 150#			
<input type="checkbox"/> MODEL _____ <input type="checkbox"/> GUARD FULLY ENCL				DRAINS			
<input type="checkbox"/> BELT DRIVER: (YES <input checked="" type="checkbox"/>) (NO <input type="checkbox"/>)				TESTS			
<input type="checkbox"/> PULL SIZE _____ <input type="checkbox"/> WEIGHT _____				MECHANICAL RUN IN (YES <input type="checkbox"/>) (NO <input type="checkbox"/>)			
<input checked="" type="checkbox"/> GUARD FULLY ENCL STATIC COND (YES <input checked="" type="checkbox"/>) (NO <input type="checkbox"/>)				WITNESSED PERFORMANCE (YES <input type="checkbox"/>) (NO <input type="checkbox"/>)			
<input type="checkbox"/> OTHER _____				NON-WITNESSED PERF. (YES <input type="checkbox"/>) (NO <input type="checkbox"/>)			
<input type="checkbox"/> FAN OR BLOWER WEIGHT				SHOP INSPECTION (YES <input type="checkbox"/>) (NO <input type="checkbox"/>)			
				OTHER _____			

ITEMS TO BE INCLUDED BY VENDOR:

- | | | |
|---|--|---|
| <input checked="" type="checkbox"/> COMMON BASEPLATE | <input type="checkbox"/> SILENCER (INLET <input type="checkbox"/>) (OUTLET <input type="checkbox"/>) | <input checked="" type="checkbox"/> INLET (SCREEN <input type="checkbox"/>) (FILTER <input type="checkbox"/>) |
| <input checked="" type="checkbox"/> COMMON PANEL | <input type="checkbox"/> DUCTING TRANSITION PIECE | <input checked="" type="checkbox"/> HOUSING DRAIN CONNECTION |
| <input checked="" type="checkbox"/> PERFORMANCE CURVE | <input type="checkbox"/> VIBRATION ISOLATION | <input checked="" type="checkbox"/> SPARK RESISTANT CONSTRUCTION |
| <input type="checkbox"/> SECTIONAL DRAWING | <input type="checkbox"/> TYPE _____ | <input type="checkbox"/> INSULATION STUDS |
| <input checked="" type="checkbox"/> OUTLINE DRAWING | <input type="checkbox"/> SPECIAL COATINGS | <input checked="" type="checkbox"/> INSPECTION ACCESS |
| <input type="checkbox"/> INLET BOXES | <input checked="" type="checkbox"/> PAINT (PRIMER <input checked="" type="checkbox"/>) (MFG STD <input checked="" type="checkbox"/>) | <input type="checkbox"/> HEAT SHIELDS |

* STD CONDITIONS: DRY AIR @ 60°F AND 14.7 PSIA DENSITY .075 LB/FT³.SAFETY CLASSIFICATION 3

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ATTACHMENT B
EQUIPMENT MAXIMUM ENVELOPE AND MODEL NUMBER
OR EQUAL

TAG NUMBER	MODEL NUMBER*	MAXIMUM ENVELOPE (inches)		
		LENGTH	WIDTH	HEIGHT
BL-560-001A	Buffalo Forge Model RE-4	25	35	35
BL-560-001B	Buffalo Forge Model RE-4	25	35	35

*Equipment shall be of this model number or equal.

SECTION 15894
VIBRATING FILTERS
B-595-P-P33B-15894

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA	YES	___	NO	<u>X</u>
QUALITY LEVEL	I	___	II	<u>X</u>
SAFETY CLASS	1	___	2	<u>X</u>
			3	<u>X</u>
			4	___

ORIGINATOR:

J. J. Ichkhan
J. J. Ichkhan, Mechanical Eng. 1/26/93

CHECKER:

D. A. Buzzelli
D. A. Buzzelli, Lead Disc. Checker 1-26-93

APPROVED BY:

R. B. Erickson
C. J. Divona Lead Discipline Engineer

1-26-93
Date

Rev. 0

SECTION 15894
VIBRATING FILTERS
B-595-P-P33B-15894

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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>
A	DATA SHEETS
B	EQUIPMENT MAXIMUM ENVELOPE AND MODEL NUMBER OR EQUAL

9413202.0788

**SECTION 15894
VIBRATING FILTERS**

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the technical requirements for the design, materials, fabrication, testing and preparation for shipment for vibrating filter units. These units consist of tubular filter elements valved to operate and backwash individually, mounted in parallel on common inlet, outlet, backwash supply and drain headers.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B16.5 1988 Pipe Flanges and Flanged Fittings

ANSI B36.19M 1985 Stainless Steel Pipe

**AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
Boiler and Pressure Vessel Code**

ASME Section II, 1989 Material Specifications-Ferrous
Part A Materials

SA-240 Specification for Heat-Resisting Chromium
and Chromium-Nickel Stainless Steel Plate,
Sheet, and Strip for Pressure Vessels

SA-790/SA-790M Specification for Seamless and Welded
Ferritic/Austenitic Stainless Steel Pipe

ASME Section VIII, 1989 Rules for Construction of Pressure
Division 1 Vessels

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 1990 Structural Welding Code Steel, 12th
Edition

9413202.0789

INSTRUMENT SOCIETY OF AMERICA (ISA)

ISA S20 1981 Specification Forms for Process
Measurement and Control Instruments,
Primary Elements and Control Valves

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC SP-6 1989 Surface Preparation Specification
No. 6, Commercial Blast Cleaning

1.3 **RELATED REQUIREMENTS**

Specification Section 01730	Operation and Maintenance Data
Specification Section 05063	Welding Pressure Vessels
Specification Section 15196	Identification and Tagging Methods for Mechanical Equipment
Specification Section 16610	Electrical Requirements for Packaged Mechanical Equipment
Specification Section 17892	Frit Slurry Filter Local Panels
Specification Section 17893	Instruments Furnished with Mechanical Equipment Frit Slurry Filter

1.4 **DEFINITIONS**

FAT - Factory Acceptance Test

1.5 **SYSTEM DESCRIPTION**

(Not Used)

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and
Data Requirements section of the Order/Subcontract.

1.6.1 Documentation which shows that the control panels for the
vibrating filters are in accordance with Specification
Section 17892.

1.6.2 Drawings

- 1.6.2.1 A. Certified dimensional outline drawings shall be submitted for Buyer approval. These drawings shall indicate dimensions, shipping weights, operating weights, clearances to be maintained, size and location of all connections, lifting supports, materials of construction and corrosion allowances. They shall include equipment support data and equipment performance data (this includes performance curves). Drawings which include the base frame shall depict base plate thickness at the foundation bolts.
- B. Sectional drawings. These drawings shall show inside arrangement construction and details for each component.
- C. Allowable loads on the vibrating filter discharge nozzles and suction nozzles shall be furnished for Buyer approval.

All drawings shall include a detailed Bill of Materials. This shall list manufacturer, type and rating of all component parts or assemblies.

1.6.3 Electrical Diagrams

Electrical diagrams shall be submitted in accordance with Specification Section 16610.

1.6.4 Technical Data

- 1.6.4.1 Design Calculations - Seller shall provide an engineering design analysis with supporting calculations used to establish performance, bearing loads and operating characteristics. These calculations shall be complete and in sufficient detail to permit second or third-party review.
- 1.6.4.2 Descriptive Literature - Descriptive literature shall be provided. This literature shall include equipment ratings, model numbers, operating characteristics and technical descriptions.
- 1.6.4.3 Data Sheets
- A. Seller shall submit completed data sheets for the furnished equipment. These data sheets shall reflect the design parameters in Data Sheets P33B-DS-1 and DS-2 (Attachment A).
- B. Complete instrumentation data sheets, ISA S20 specification forms for process measurement and control instruments, primary elements and control valves.

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1.6.4.4 Vibrating Filter Performance Curves

Vibrating filter performance curves shall be submitted for Buyer approval. These curves shall include efficiency, pressure drop, viscosity and specific gravity corrections.

1.6.4.5 Factory Acceptance Tests (FATs) as defined in Paragraph 2.2.13.

1.6.5 Spare Parts List

A list of recommended spare parts for one (1) year's routine operation shall be submitted. The spare parts list shall include sufficient data to permit procurement either from original manufacturer or any subsupplier.

1.6.6 Installation, Operation and Maintenance Manuals

Seller shall submit operation and maintenance manuals. These shall cover the vibrating filters furnished in accordance with this specification section. These manuals shall fully detail sequences of disassembly, repair, adjustment, reassembly, lubrication and troubleshooting. Troubleshooting sections shall include fault trees to guide both mechanical and electrical diagnostics. The manuals shall include reduced-size copies of any assembly drawing, subassembly drawing or parts list needed for routine maintenance and overhaul. This data shall be submitted in accordance with Specification Section 01730. Complete installation manuals shall be submitted.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

- | | | |
|----|-----------------------------|--------------------------|
| A. | Site Elevation | 714 feet above sea level |
| B. | Barometric Pressure | 14.3 psia |
| C. | Outside Design Temperature | |
| 1) | Maximum Design Temperature | 110°F |
| 2) | Minimum Design Temperature | -20°F |
| 3) | Wet Bulb Design Temperature | 68°F |

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1.8.2 Operating Environment

- | | | |
|----|---------------------|----------------|
| A. | Normal Temperature | 60° to 104°F |
| B. | Maximum Temperature | 104°F |
| C. | Relative Humidity | Not controlled |

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- 2.1.1 The vibrating filter system shall be a multiple element-type filter. It shall be furnished as a complete, automatic, self-cleaning filter system. The vibrating filter system design shall be in accordance both with ASME Section VIII, Division 1 and ANSI B36.19M for interconnecting piping.
- 2.1.2 The vibrating filter system shall be designed to maintain the design flow during the backwashing cycle. The required number of elements shall be specified by Seller in accordance with P33B-DS-1 and DS-2 (Attachment A).
- 2.1.3 The vibrating filter system logic shall control a backwash flow scheme. Process water shall be used as the backwash source. Backwash duration and required quantity of backwash fluid shall be specified by Seller.
- 2.1.4 Seller shall furnish the vibrating filter with automatic backwashing and a multiple tube-type filtration system. It shall be designed as a complete, self-contained, modular package capable of continuous operation.
- 2.1.5 The vibrating filter system shall be skid-mounted. The maximum envelope dimension and model number or equal are shown in Attachment B.
- 2.1.6 The vibrating filter skid shall be anchored with a minimum of four equally spaced 1/2 inch diameter anchor bolts. Bolt holes shall be 11/16 inch diameter.

2.2 FABRICATION AND MANUFACTURE

2.2.1 General Requirements

The vibrating filter system shall be manufactured in such a manner that pressure drop shall be at its minimum over the flow range of the filter system. The noise level shall not exceed 85 dB at 3 feet peripheral around the filter system assembly.

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- 2.2.2 The vibrating filter housing shall be Type SA-240 stainless steel in accordance with ASME Section II, Part A.
- 2.2.3 All interconnecting valves shall be of the full port opening type to minimize pressure drop across the system.
- 2.2.4 The vibrating filter housing shall be manufactured in accordance with ASME Section VIII, Division 1.
- 2.2.5 Piping and flanged fittings in the vibrating filter system shall be in accordance both with ANSI B16.5 and ASME Section II, Part A SA-790/SA-790M.
- 2.2.6 Burst strength of the filter element shall be not less than 200 percent of the design pressure in accordance with P33B-DS-1 and DS-2 (Attachment A).
- 2.2.7 Welding on the skid of the skid-mounted vibrating filter shall be in accordance with AWS D1.1. Welding of pressure vessels shall be in accordance with Specification Section 05063. The skid material shall be Type 316L stainless steel.
- 2.2.8 The control panel shall be mounted directly on the skid. It shall provide all instruments and controls necessary for safe, reliable and continuous unattended operation of the vibrating system at the specified operating and design conditions of P33B-DS-1 (Attachment A). The control panel shall be in accordance with Specification Section 17892.
- 2.2.9 The vibrating filter system shall be furnished with an automatic sequence programmer. This programmer shall control the sequential backwash of the filter elements. One set of elements shall be backwashed at a time. The programmer shall be supplied with the capability of varying the backwash cycle time. It shall also possess a manual override capability to allow manual filter element backwash. Instruments and control panel shall be in accordance with Specification Section 17892 and 17893.
- 2.2.9.1 The backwash cycle shall be capable of being initiated by both of the following:
- A. Differential pressure across the filter system.
 - B. Locally-mounted manual switch.
- The open and close rates of both the feed and backwash control valves shall be adjustable.
- 2.2.10 Electrical Requirements
- 2.2.10.1 Electrical components shall be in accordance with Specification Section 16610.

2.2.11 Coatings

After completion of all fabrication procedures the external surfaces of each vibrating filter shall be thoroughly cleaned of all foreign material, including rust, in accordance with SSPC SP-6. Manufacturer's standard prime and finish paint or coatings shall be applied. Stainless steel surfaces shall not be painted unless specified otherwise.

2.2.12 Labeling and tagging shall be in accordance with Specification Section 15196, Paragraph 2.2.2, Type 6.

2.2.13 Factory Acceptance Tests (FATs)

- A. Seller shall shop test the vibrating filter system to verify performance, pressure drops and flow rates. A detailed shop testing procedure shall be submitted for Buyer approval before testing begins.
- B. All pressure-containing elements shall be hydrostatically tested for a period of time not less than 30 minutes. The test pressure shall be not less than one and one-half times the vibrating filter system's design pressure. During the test no visually-detectable leakage shall occur at any joint.
- C. Seller shall furnish certified shop FAT reports prior to shipment.

2.2.14 Packaging

2.2.14.1 Preparation for shipment and packing shall be in accordance with Seller's standards. At minimum, they shall provide protection against corrosion and damage during normal handling, shipping and storage. Minimum preparation shall include the requirements listed below.

2.2.14.2 Machined surfaces, threads, bearings and bearing housings shall be protected during shipment by application of grease or other suitable rust-inhibiting compound.

2.2.14.3 Flanged openings shall be covered with wood or plastic protectors. Protectors shall be installed with not less than four (4) full diameter steel bolts and nuts.

2.2.14.4 Threaded connections and tapped holes shall be capped or plugged. Compatible materials shall be used to prevent thread damage.

2.2.14.5 Vibrating filter unit assemblies shall be shipped fully assembled.

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- 2.2.14.6 Bracing, supports and rigging connections shall be provided to prevent damage during shipment, lifting and unloading.
- 2.2.14.7 Separate or loose parts shall be completely boxed. The box shall then be attached to the main item to be shipped as a unit.
- All shipping boxes shall be identified by Seller's order number, equipment number and equipment description.

PART 3 EXECUTION

(Not Used)

END OF SECTION

9413202.0796

FLUOR DANIEL DATA SHEET U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 VIBRATING - PRESSURE FILTER	NO.	BY DATE	REVISION	SHEET NO. P33B-DS-1	REV. 0
	▲			DATE 10-19-88	CONTRACT 845734
	▲			TAG NO. FL-580-002V	
	▲			SPECIFICATION SECT NO. 15894	
	▲			FOR CLIENT USE	
	▲			ORIG BY K.M. Crabb	CHK'D RMM

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION 15894		P&ID NO.:
ITEM NO FL-580-002V	SERVICE PFSFT FILTER	
PROCESS DESIGN		
WATER SOURCE LPW	PRESSURE 65	PSIG, TEMP 40-70 °F
FEED QUALITY: SUSPENDED SOLIDS	370,000	PPM, J.T.U.
OTHER		
EFFLUENT QUALITY:	MAKE EQUIVALENT TO 15 MESH J.T.U.	
OTHER		
TOTAL FLOW RATE 70	GPM, ALLOWABLE HEAD LOSS	12 - 15 PSI
UNIT CAPACITY 45 - 95 (46,200 LB/HR)	GPM, FILTRATION RATE	10 - 15 GPM/SQ. FT.
BACKWASH: RATE 250	GPM, QUANTITY	21 GALLONS PER CYCLE
LENGTH OF RUN BEFORE BACKWASH BACKFLUSH @ ΔP = 15 psi		
UPSTREAM TREATMENT:		
DOWNSTREAM TREATMENT:		
MECHANICAL DESIGN		
FILTER MEDIA:		
TOP LAYER:	TYPE	QTY EFFECTIVE SIZE RANGE
	UNIFORMITY COEFF	DENSITY BED DEPTH
	UNIFORMITY COEFF	DENSITY BED DEPTH
BOTTOM LAYER:	TYPE	QTY EFFECTIVE SIZE RANGE
	UNIFORMITY COEFF	DENSITY BED DEPTH
OTHER REQUIREMENTS:		
PRESSURE VESSEL:	NUMBER	SIDE SHALL FT., DIAMETER FT.
TYPE OF FILTER:	VERTICAL <input type="checkbox"/> HORIZONTAL <input type="checkbox"/> OTHER	
NUMBER OF COMPARTMENTS		
MATERIAL OF CONSTRUCTION 316L SS		
CORROSION ALLOWANCE DESIGN PRESSURE 150 PSIG @ 150°F		
TOTAL WALL THICKNESS INCLUDING CORROSION ALLOWANCE: SIDE SHELL ENDS		
ASME CODED WITH STAMP <input type="checkbox"/> WITHOUT STAMP <input type="checkbox"/> NON-CODED <input type="checkbox"/>		
MANHOLE SIZE	LOCATION	HANDHOLE SIZE LOCATION
TANK SUPPORT: FIXED LEGS <input type="checkbox"/> SCREW-TYPE JACK LEGS <input type="checkbox"/>		
INLET DISTRIBUTOR:		
UNDER DRAIN: STRAINERS <input type="checkbox"/> DOUBLE DISH <input type="checkbox"/> GROUT <input type="checkbox"/> OTHER		
FACE PIPING:	SIZE	RATING MATERIAL
CONNECTIONS 2 INCH AND LARGER SHALL BE AS A FLANGED <input type="checkbox"/> OTHER		
VALVING: TYPE	MATERIAL OF CONSTRUCTION TRIM	
OPERATOR		
BACKWASH & RINSE CONTROL:		
SAMPLE VALVES <input type="checkbox"/>	PRESSURE GAUGES <input type="checkbox"/>	WATER METER <input type="checkbox"/> SKID MOUNTED <input type="checkbox"/>
BACKWASH PUMP & DRIVER <input type="checkbox"/>		
PAINTING: INTERNAL PRIME	FINISH	
EXTERNAL PRIME	FINISH	
OTHER		
105\06\101\207\84571878.MIS\WP51-01\25\83 5:11pm		
SAFETY CLASSIFICATION 3		


FLUOR DANIEL
DATA SHEET

U.S. Department of Energy
 Hanford Waste Vitrification Plant
 Richland, Washington
 DOE Contract DE-AC06-86RL10838

VIBRATING - PRESSURE FILTER

NO.	BY DATE	REVISION	SHEET NO.	REV.
△			P33B-DS-1	0
△			DATE 10-19-88	CONTRACT 845734
△			TAG NO. FL-580-002V	
△			SPECIFICATION SECT NO. 15894	
△			FOR CLIENT USE	
△			ORIG BY K.M. Crabb	CHK'D RMM
△			APPR'D	

 ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION **15894**

P&ID NO.:

ITEM NO SERVICE

SHIPPING WEIGHT

LBS., VOLUME

CU. FT.

REMARKS:

SKETCH:

NOTE: Process data based on Model SS-84-203 Ronningen-Petter Vibrating Slurry Filter.

9413202.0798

FLUOR DANIEL DATA SHEET U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 VIBRATING - PRESSURE FILTER	NO.	BY DATE	REVISION	SHEET NO. P33B-DS-2	REV. 0
	▲			DATE 10-19-88	CONTRACT 845734
	▲			TAG NO. FL-580-003V	
	▲			SPECIFICATION SECT NO. 15894	
	▲			FOR CLIENT USE	
	▲			ORIG BY K.M. Crabb	CHK'D RMM

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION 15894		P&ID NO.:
ITEM NO FL-580-003V	SERVICE DFSFT FILTER	
PROCESS DESIGN		
WATER SOURCE LPW	PRESSURE 65	PSIG, TEMP 40-70 °F
FEED QUALITY: SUSPENDED SOLIDS 34,000		PPM, J.T.U.
OTHER		
EFFLUENT QUALITY: MAKE EQUIVALENT TO 60 MESH		J.T.U.
OTHER		
TOTAL FLOW RATE 85	GPM, ALLOWABLE HEAD LOSS	12 - 15 PSI
UNIT CAPACITY 45 - 85 (46,200 LB/HR)	GPM, FILTRATION RATE	10 - 15 GPM/SQ. FT.
BACKWASH RATE 250	GPM, QUANTITY	21 GALLONS PER CYCLE
LENGTH OF RUN BEFORE BACKWASH	BACKFLUSH @ ΔP = 15 psi	
UPSTREAM TREATMENT:		
DOWNSTREAM TREATMENT:		
MECHANICAL DESIGN		
FILTER MEDIA:		
TOP LAYER:	TYPE	QTY EFFECTIVE SIZE RANGE
	UNIFORMITY COEFF	DENSITY BED DEPTH
	UNIFORMITY COEFF	DENSITY BED DEPTH
BOTTOM LAYER:	TYPE	QTY EFFECTIVE SIZE RANGE
	UNIFORMITY COEFF	DENSITY BED DEPTH
OTHER REQUIREMENTS:		
PRESSURE VESSEL: NUMBER SIDE SHELL FT., DIAMETER FT.		
TYPE OF FILTER: VERTICAL <input type="checkbox"/> HORIZONTAL <input type="checkbox"/> OTHER		
NUMBER OF COMPARTMENTS		
MATERIAL OF CONSTRUCTION 316L SS		
CORROSION ALLOWANCE DESIGN PRESSURE 150 PSIG @ 150°F		
TOTAL WALL THICKNESS INCLUDING CORROSION ALLOWANCE: SIDE SHELL ENDS		
ASME CODED WITH STAMP <input type="checkbox"/> WITHOUT STAMP <input type="checkbox"/> NON-CODED <input type="checkbox"/>		
MANHOLE SIZE LOCATION HANDHOLE SIZE LOCATION		
TANK SUPPORT: FIXED LEGS <input type="checkbox"/> SCREW-TYPE JACK LEGS <input type="checkbox"/>		
INLET DISTRIBUTOR:		
UNDER DRAIN: STRAINERS <input type="checkbox"/> DOUBLE DISH <input type="checkbox"/> GROUT <input type="checkbox"/> OTHER		
FACE PIPING: SIZE RATING MATERIAL		
CONNECTIONS 2 INCH AND LARGER SHALL BE AS A FLANGED <input type="checkbox"/> OTHER		
VALVING: TYPE MATERIAL OF CONSTRUCTION TRIM		
OPERATOR		
BACKWASH & RINSE CONTROL:		
SAMPLE VALVES <input type="checkbox"/> PRESSURE GAUGES <input type="checkbox"/> WATER METER <input type="checkbox"/> SKID MOUNTED <input type="checkbox"/>		
BACKWASH PUMP & DRIVER <input type="checkbox"/>		
PAINTING: INTERNAL PRIME FINISH		
EXTERNAL PRIME FINISH		
OTHER		
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NOTE: Process data based on Model SS-84-203 Ronningen-Petter Vibrating Slurry Filter.

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ATTACHMENT B
EQUIPMENT MAXIMUM ENVELOPE
AND MODEL NUMBER OR EQUAL

TAG NUMBER	MODEL NUMBER*	MAXIMUM ENVELOPE (inches)		
		LENGTH	WIDTH	HEIGHT
FL-580-002V	Ronningen-Petter Model 203 A-BW-VIB	63	40	70
FL-580-003V	Ronningen-Petter Model 203 A-BW-VIB	63	40	70

*Equipment shall be of this model number or equal.

SECTION 15896
ROUGHING FILTERS/HEPA FILTERS (MECHANICAL)
B-595-P-P33B-15896

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA YES NO X
QUALITY LEVEL I II X
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

CHECKER:

S. J. Ichkhan 1-26-93
S. J. Ichkhan, Mechanical Engineer Date

D. A. Buzzelli 1-26-93
D. A. Buzzelli, Lead Disc. Checker Date

APPROVED BY:

R. B. Erickson
C. J. Divona Lead Discipline Engineer

1-26-93
Date

Rev. 0

SECTION 15896
ROUGHING FILTERS/HEPA FILTERS (MECHANICAL)
B-595-P-P33B-15896

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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>
A	DATA SHEETS
B	EQUIPMENT MAXIMUM ENVELOPE AND MODEL NUMBER OR EQUAL

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SECTION 15896
ROUGHING FILTERS/HEPA FILTERS (MECHANICAL)

PART 1 GENERAL

1.1 SUMMARY

This specification section establishes the minimum requirements for design, fabrication and testing of high efficiency particulate air (HEPA) and roughing filters to be used in an environmental protection application.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B1.20.1 1983 (Rev. 1992) Pipe Threads, General Purpose (Inch)

ANSI B16.5 1988 Pipe Flanges and Flanged Fittings

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
and/or

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ANSI/ASME NQA-1 1989 Quality Assurance Program Requirements for Nuclear Facilities

ANSI/ASME N509 1989 Nuclear Power Plant Air Cleaning Units and Components; Interpretations No. 1

ANSI/ASME N510 1989 Testing of Nuclear Air Treatment Systems

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A176 1990 Standard Specification for Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip

INSTITUTE OF ENVIRONMENTAL SCIENCES (IES)

IES RP-CC-001-83-T 1983 Recommended Tentative Practices for Testing and Certification of HEPA Filters

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MILITARY SPECIFICATIONS (MIL)

MIL-F-51068	1988 (Rev. F) Filter, Particulate, (High Efficiency, Fire Resistant)
MIL-F-51079	1988 (Rev. D) Filter Medium Fire-Resistant, High-Efficiency

NUCLEAR STANDARD

NE F3-43	1984 Quality Assurance Testing of HEPA Filters and Respirator Canisters
NE F3-45T	1984 Specifications for HEPA Filters Used by DOE Contractors

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC SP-6	1989 Surface Preparation Specification No. 6, Commercial Blast Cleaning
-----------	---

UNDERWRITERS LABORATORIES INC. (UL)

UL-586	1990 UL Standard for Safety High Efficiency Particulate Air Filter Units, 7th Edition
--------	---

1.3 RELATED REQUIREMENTS

Specification Section 01730	Operation and Maintenance Data
Specification Section 15196	Identification and Tagging Methods for Mechanical Equipment

1.4 DEFINITIONS

FAT	- Factory Acceptance Test
HEPA	- High Efficiency Particulate Air

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 The following documents shall be submitted for Buyer approval:

1.6.1.1 HEPA filter outline drawings, dimensions and weight.

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1.6.1.2 Detail drawings of the HEPA filter housing and its various components. The drawings shall also contain weights, anchor bolt details and materials used.

1.6.2 Data Sheets

Seller shall submit complete data sheets for the furnished equipment. These data sheets shall reflect the design parameters in Data Sheets P33B-DS-1 through DS-20 (Attachment A).

1.6.3 A list of manufacturer's recommended spare parts for one (1) year's routine operation. Include sufficient data to permit procurement either from the original manufacturer or any subsupplier.

1.6.4 Operation and maintenance manuals in accordance with Specification Section 01730. Complete installation manuals shall also be submitted.

1.6.5 Factory Acceptance Tests (FATs) in accordance with Paragraph 2.5. Procedure and FAT reports shall be submitted for Buyer approval.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

- A. Site Elevation 714 feet above sea level
- B. Barometric Pressure 14.3 psia
- C. Outside Design Temperature
 - (1) Maximum Design Temperature 110°F
 - (2) Minimum Design Temperature -20°F
 - (3) Wet Bulb Design Temperature 68°F

1.8.2 Operating Environment

- A. Normal Temperature 60°F to 104°F
- B. Maximum Temperature 104°F
- C. Relative Humidity Not controlled

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PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

The following requirements apply to the HEPA filters furnished in accordance with this specification section.

2.1.1 Filter Medium

The material for the HEPA filter medium shall be in accordance both with MIL-F-51079 and ANSI/ASME N509.

2.1.2 HEPA Filter Housing

The materials for the HEPA filter housing shall be Type 304L stainless steel in accordance both with ASTM A176 and ANSI/ASME N509.

2.1.3 Adhesives

Adhesives used both to seal the filter pack into the case and glue gaskets to the case shall either be nonflammable or self-extinguishing. Where the dried film is exposed to an open flame, it shall either not burn or not continue to support combustion when the source of ignition is removed.

2.1.4 Gaskets and Fluid Seals

The HEPA filter shall have a filter-to-housing seal using a continuous knife edge on the mounting frame of the filter housing that mounts to a continuous perimeter channel filled with highly viscous nondrying compound.

2.2 FABRICATION AND MANUFACTURE

Fabrication and manufacture of the HEPA filter assembly shall be in accordance with ANSI/ASME N509, MIL-F-51068, MIL-F-51079 and UL-586. The Quality Assurance Program shall be in accordance with ANSI/ASME NQA-1 requirements.

2.2.1 The HEPA filter housing shall be designed for bag-in/bag-out capability suitable for installation of a single-element HEPA filter. The housing shall allow the operator to change filters without coming into direct contact with the filter element.

2.2.2 Each housing door shall be equipped with a double ribbed bag-out port designed for accepting an 8 mil polyvinyl chloride (PVC) bag. Housing shall be designed to prevent ripping or tearing of the bag during operation.

2.2.3 Two bags (one for equipment start-up and one spare) shall be provided and shipped with each HEPA filter housing. The bags shall include an integral shock cord and mittens to facilitate changeout.

2.2.4 One banding kit shall be supplied with the HEPA filter housing. The kit shall include all tools and straps necessary for a complete bag-out procedure.

2.2.5 HEPA filter housing flanges shall be in accordance with ANSI B16.5. Pipe threads shall be in accordance with ANSI B1.20.1.

2.2.6 Welding

All welding for the HEPA filter assembly shall be in accordance with ANSI/ASME N509.

2.2.7 The base of the HEPA filter housing shall have provisions to be anchored with no less than eight (8) 1/2-inch diameter bolts, equally spaced. Bolt holes shall be 11/16 inch in diameter.

2.2.8 Design Envelope. Maximum envelope sizes and model numbers of equipment or equal are shown in Attachment B.

2.3 COATINGS

After completion of all fabrication procedures the external surfaces of the HEPA filters shall be thoroughly cleaned of all foreign material, including rust, in accordance with SSPC SP-6. Manufacturer's standard prime and finish paint or coatings shall be applied. Stainless steel surfaces shall not be painted unless specified otherwise.

2.4 LABELING

Labeling shall be in accordance with Specification Section 15196, Paragraph 2.2.2, Type 6. This shall be in addition to the manufacturer's identification plate.

2.5 TESTING

Testing of HEPA filter assembly and FAT reports shall both be in accordance with ANSI/ASME N510, NE F3-45T and IES RP-CC-001-83-T. Testing shall also be in accordance with NE F3-43 Department of Energy (DOE) document.

2.6 PACKAGING

2.6.1 Preparation for shipment and packing shall be in accordance with Seller's standards. At minimum, they shall provide protection against corrosion and damage during normal handling, shipping and

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storage. Minimum preparation shall include the requirements listed below.

- 2.6.2 Machined surfaces and threads shall be protected during shipment by application of grease or other suitable rust-inhibiting compound.
- 2.6.3 Flanged openings shall be covered with wood or plastic protectors. Protectors shall be installed with not less than four (4) full diameter steel bolts and nuts.
- 2.6.4 Threaded connections and tapped holes shall be capped or plugged. Compatible materials shall be used to prevent thread damage.
- 2.6.5 Bracing, supports and rigging connections shall be provided to prevent damage during shipment, lifting and unloading.
- 2.6.6 Separate or loose parts shall be completely boxed. The box shall then be attached to the main item to be shipped as a unit.

All shipping boxes shall be identified by Seller's order number, equipment number and equipment description.

PART 3 EXECUTION

(Not Used)

END OF SECTION

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ATTACHMENT A

FLUOR DANIEL DATA SHEET U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 HEPA FILTERS	NO.	BY DATE	REVISION	SHEET NO. P33B-DS-1	REV. 0
	▲			DATE 12-19-89	CONTRACT 845734
	▲			TAG NO. FH-450-001A AND FH-450-001B	
	▲			SPECIFICATION SECT NO. 15896	
	▲			FOR CLIENT USE	
	▲			ORIG BY S. Strausburg	CHK'D KJM

TITLE **PROCESS COOLING WATER HEPA FILTER**
 NO UNITS REQ'D 2 NO UNITS OPERATING 1 SPARE 0 TYPE (HORIZONTAL) (VERTICAL X)
 TYPE ELEMENT (THROW - AWAY X) (CLEANABLE) OTHER

PROCESS DESIGN

NAME OF FLUID FILTERED SATURATED AIR AIR & PROCESS WATER VAPOR
 QUANTITY FLUID FILTERED 149 35 ACFM (RATED) LB/HR
 OPERATING PRESSURE -0.1 PSIG
 OPERATING TEMPERATURE 77 °F
 SPECIFIC GRAVITY @ OPER TEMP 0.071 LB/FT³
 VISCOSITY @ OPER TEMP 0.02 C_p
 ALLOWABLE PRESSURE DROP ΔP 1.0 Clean, 5.0 Dirty "H₂O
 NAME OF PARTICLES REMOVED PARTICLES CONTAMINATED W/RADIOACTIVE COMPONENTS
 MAXIMUM PARTICLE SIZE MICRON
 MINIMUM PARTICLE SIZE MICRON
 SIZE OF PARTICLES REMOVED 99.97% OF 0.3 MICRONS AND LARGER MICRON
 QUANTITY PARTICLES TO BE REMOVED #/HR

MECHANICAL DESIGN

DESIGN PRESSURE 3/5 PSIG DESIGN TEMPERATURE 150 °F CORROSION ALLOWANCE 1/16"
 CODES: ASME (YES ☒) (NO ☐) STAMP (YES ☒) (NO ☐) OTHER

MATERIALS OF CONSTRUCTION		*CONNECTIONS	NO	SIZE	RATING
FILTER CASE	<u>304L SS</u>	INLET	<u>1</u>	<u>1-1/2"</u>	<u>150#</u>
FILTER COVER		OUTLET	<u>1</u>	<u>1-1/2"</u>	<u>150#</u>
FILTER ELEMENT SUPPORTS		VENT			
FILTER CASE SUPPORTS		DRAIN			
FILTER CONNECTIONS		INSTRUMENTS			
ELEMENTS					
GASKETS					

*ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED

FILTER COVER TYPE (THRU BOLTED-ON (X), SWING BOLTED-ON (), CLAMP-ON (), SCREWED (), SPECIAL (), - SEE NOTES)

DAVIT (YES ☐) (NO ☒): FILTER CASE SUPPORTS (YES ☒) (NO ☐) MINIMUM HEIGHT SANDBLAST (YES ☐) (NO ☒): PAINT PRIMER (YES ☐) (NO ☒)

DATA BY VENDORS

MFR TYPE NO
 NO REQ'D : NO OPERATING : NO SPARE
 NO ELEMENTS EACH FILTER : SIZE "O.D. x "STR: MATERIAL
 TOTAL ELEMENT DIRT HOLDING CAPACITY CU FT: SURFACE SQ FT
 CLEAN PRESSURE DROP PSI: SHIPPING WEIGHT
 DESCRIBE METHOD OF REMOVING ELEMENTS:

IS DIMENSIONAL OUTLINE INCLUDED (YES ☐) (NO ☐) IS FILTER IN ACCORD WITH SPECS (YES ☐) (NO ☐)

NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS. (2) VAPOR IS

SAFETY CLASSIFICATION 3

NORMALLY AIR SATURATED WITH WATER VAPOR. (3) FLOW THRU FILTER IS FROM BOTTOM UP.

ATTACHMENT A

FLUOR DANIEL DATA SHEET U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 HEPA FILTERS	NO.	BY DATE	REVISION	SHEET NO. P33B-DS-2	REV. 0
	▲			DATE 12-20-89	CONTRACT 845734
	▲			TAG NO. FH-460-001A AND FH-460-001B	
	▲			SPECIFICATION SECT. NO. 15896	
	▲			FOR CLIENT USE	
	▲			ORIG BY S. Strauburg	CHK'D KJM

TITLE MELTER COOLING WATER HEPA FILTER

NO UNITS REQ'D 2 NO UNITS OPERATING 1 SPARE - TYPE (HORIZONTAL -) (VERTICAL X)

TYPE ELEMENT (THROW - AWAY X) (CLEANABLE -) OTHER -

PROCESS DESIGN

NAME OF FLUID FILTERED <u>SATURATED AIR</u>	AIR & MELTER COOLING WATER VAPOR
QUANTITY FLUID FILTERED <u>149</u>	<u>35 ACFM (RATED)</u> LB/HR
OPERATING PRESSURE <u>-0.1</u>	PSIG
OPERATING TEMPERATURE <u>77</u>	°F
SPECIFIC GRAVITY @ OPER TEMP <u>0.071</u>	LB/FT ³
VISCOSITY @ OPER TEMP <u>0.02</u>	Cp
ALLOWABLE PRESSURE DROP <u>AP 1.0 Clean, 5.0 Dirty</u>	H ₂ O
NAME OF PARTICLES REMOVED <u>PARTICLES CONTAMINATED W/ RADIOACTIVE PARTICLES</u>	
MAXIMUM PARTICLE SIZE	MICRON
MINIMUM PARTICLE SIZE	MICRON
SIZE OF PARTICLES REMOVED <u>99.97% OF 0.3 MICRONS AND LARGER</u>	MICRON
QUANTITY PARTICLES TO BE REMOVED	#/HR

MECHANICAL DESIGN

DESIGN PRESSURE 3-5 PSIG DESIGN TEMPERATURE 150 °F CORROSION ALLOWANCE None

CODES: ASME (YES ☒) (NO ☐) STAMP (YES ☒) (NO ☐) OTHER -

MATERIALS OF CONSTRUCTION		*CONNECTIONS	NO	SIZE	RATING
FILTER CASE	<u>304L SS</u>	INLET	<u>1</u>	<u>1-1/2"</u>	<u>150#</u>
FILTER COVER		OUTLET	<u>1</u>	<u>1-1/2"</u>	<u>150#</u>
FILTER ELEMENT SUPPORTS		VENT			
FILTER CASE SUPPORTS		DRAIN			
FILTER CONNECTIONS		INSTRUMENTS			
ELEMENTS					
GASKETS					

*ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED

FILTER COVER TYPE (THRU BOLTED-ON ☒, SWING BOLTED-ON ☐, CLAMP-ON ☐, SCREWED ☐, SPECIAL ☐, - SEE NOTES)DAVIT (YES ☐) (NO ☒): FILTER CASE SUPPORTS (YES ☒) (NO ☐) MINIMUM HEIGHT -SANDBLAST (YES ☐) (NO ☒): PAINT PRIMER (YES ☐) (NO ☒) -

DATA BY VENDORS

MFR - TYPE NO -

NO REQ'D -: NO OPERATING -: NO SPARE -

NO ELEMENTS EACH FILTER -: SIZE - "O.D. - x - "STR: MATERIAL -

TOTAL ELEMENT DIRT HOLDING CAPACITY - CU FT: - SURFACE - SQ FT

CLEAN PRESSURE DROP - PSI: SHIPPING WEIGHT -

DESCRIBE METHOD OF REMOVING ELEMENTS: -

IS DIMENSIONAL OUTLINE INCLUDED (YES ☐) (NO ☐) IS FILTER IN ACCORD WITH SPECS (YES ☐) (NO ☐)

NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS. (2) VAPOR IS

SAFETY CLASSIFICATION 3

NORMALLY AIR SATURATED WITH WATER VAPOR. (3) FLOW THRU FILTER IS FROM BOTTOM UP.

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ATTACHMENT A

FLUOR DANIEL DATA SHEET U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 HEPA FILTERS	NO.	BY DATE	REVISION	SHEET NO. P33B-DS-3	REV 0
	▲			DATE 03-02-90	CONTRACT 845734
	▲			TAG NO. FH-520-001	
	▲			SPECIFICATION SECT. NO. 15896	
	▲			FOR CLIENT USE	
	▲			ORIG BY M.W. Bergeron	CHK'D SSL

TITLE <u>FLOOR DRAIN CATCH TANK HEPA FILTER</u>	
NO UNITS REQ'D <u>1</u>	NO UNITS OPERATING <u>1</u> SPARE <u>0</u> TYPE (HORIZONTAL <u> </u>) (VERTICAL <u>X</u>)
TYPE ELEMENT (THROW - AWAY <u>X</u>) (CLEANABLE <u> </u>) OTHER <u>NUCLEAR GRADE</u>	

PROCESS DESIGN	
NAME OF FLUID FILTERED <u>AIR (POSSIBLE HNO3 VAPOR)</u>	
QUANTITY FLUID FILTERED <u>423.0</u>	# / HR
OPERATING PRESSURE <u>.1</u>	PSIG
OPERATING TEMPERATURE <u>77</u>	°F
DENSITY @ OPER TEMP <u>.071</u>	LB / FT ³
VISCOSITY @ OPER TEMP <u>.018</u>	C _p
ALLOWABLE DIRTY PRESSURE DROP <u>1.0</u>	"H ₂ O
NAME OF PARTICLES REMOVED <u>POSSIBLY RADIOACTIVE</u>	
MAXIMUM PARTICLE SIZE <u> </u>	MICRONS
MINIMUM PARTICLE SIZE <u> </u>	MICRONS
SIZE OF PARTICLES TO BE REMOVED <u>99.97% OF .3 MICRONS PARTICLES</u>	MICRONS
QUANTITY OF PARTICLES TO BE REMOVED <u> </u>	# / HR

MECHANICAL DESIGN	
DESIGN PRESSURE <u>2.5/-1</u> PSIG	DESIGN TEMPERATURE <u>150</u> °F
CODES: ASME (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>)	CORROSION ALLOWANCE <u>1/16"</u>
STAMP (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>)	OTHER <u>NUCLEAR GRADE</u>

MATERIALS OF CONSTRUCTION		*CONNECTIONS	NO	SIZE	RATING
FILTER CASE	<u>304L S.S.</u>	INLET	<u>1</u>	<u>3"</u>	<u>150#</u>
FILTER COVER	<u>304L S.S.</u>	OUTLET	<u>1</u>	<u>3"</u>	<u>150#</u>
FILTER ELEMENT SUPPORTS	<u>304L S.S.</u>	VENT			
FILTER CASE SUPPORTS		DRAIN			
FILTER CONNECTIONS	<u>304L S.S.</u>	INSTRUMENTS			
ELEMENTS	<u>NUCLEAR GRADE</u>				
GASKETS	<u>HNO₃ RESISTANT</u>				

*ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED

FILTER COVER TYPE THRU BOLTED-ON (), SWING BOLTED-ON (X), CLAMP-ON (), SCREWED (), SPECIAL (), - SEE NOTES)

DAVIT (YES ☐) (NO ☒) ; FILTER CASE SUPPORTS (YES ☒) (NO ☐) MINIMUM HEIGHT

SANDBLAST (YES ☐) (NO ☒) ; PAINT PRIMER (YES ☐) (NO ☒)

DATA BY VENDORS	
MFR <u> </u>	TYPE NO <u> </u>
NO REQ'D <u> </u> ; NO OPERATING <u> </u> ; NO SPARE <u> </u>	
NO ELEMENTS EACH FILTER <u> </u> ; SIZE <u> </u> "O.D. <u> </u> x <u> </u> "STR: MATERIAL <u> </u>	
TOTAL ELEMENT DIRT HOLDING CAPACITY <u> </u> CU FT: <u> </u> SURFACE <u> </u> SQ FT	
CLEAN PRESSURE DROP <u> </u> PSI: SHIPPING WEIGHT <u> </u>	
DESCRIBE METHOD OF REMOVING ELEMENTS: <u> </u>	

IS DIMENSIONAL OUTLINE INCLUDED (YES ☐) (NO ☐) IS FILTER IN ACCORD WITH SPECS (YES ☐) (NO ☐)

NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS. (2) INLET LINE TO HEPA FILTER IS HEATED TO PREVENT CONDENSATE COLLECTION. TEMPERATURE AT GAS ENTERING HEPA IS INFLUENCED BY FLOW THROUGH HEATED ZONE. MAXIMUM FLOW/LOW TEMPERATURE AND LOW FLOW/MAXIMUM TEMPERATURE CASES CONSIDERED.

105\OS\101\204\84571889.001\WP51-01\25\93 4:10pm	SAFETY CLASSIFICATION <u>3</u>
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ATTACHMENT A

FLUOR DANIEL DATA SHEET U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 HEPA FILTERS	NO	BY	REVISION	SHEET NO.	REV.
		DATE		P33B-DS-4	0
	▲			DATE	CONTRACT
	▲			03-02-90	845734
	▲			TAG NO. FH-520-002	
	▲			SPECIFICATION SECT. NO. 15896	
▲			FOR CLIENT USE		
▲			ORIG BY	CHK'D	APPR'D
▲			M.W. Bergeron	SSL	

TITLE <u>REGULATED DRAIN CATCH TANK HEPA FILTER</u>					
NO UNITS REQ'D <u>1</u> NO UNITS OPERATING <u>1</u> SPARE <u>0</u> TYPE (HORIZONTAL <u> </u>) (VERTICAL <u>X</u>)					
TYPE ELEMENT (THROW - AWAY <u>X</u>) (CLEANABLE <u> </u>) OTHER <u>NUCLEAR GRADE</u>					
PROCESS DESIGN					
NAME OF FLUID FILTERED <u>AIR</u>					
QUANTITY FLUID FILTERED	<u>211.5</u>	<u>13.2</u>	} NOTE 2	# / HR	
OPERATING PRESSURE	<u>.1</u>	<u>.1</u>		PSIG	
OPERATING TEMPERATURE	<u>77</u>	<u>220</u>		°F	
DENSITY @ OPER TEMP	<u>.071</u>	<u>.055</u>		LB / FT ³	
VISCOSITY @ OPER TEMP	<u>.018</u>	<u>.021</u>		C _p	
ALLOWABLE PRESSURE DROP ΔP	<u>1.0</u>	<u>5.0</u>		"H ₂ O	
NAME OF PARTICLES REMOVED <u>POSSIBLY RADIOACTIVE</u>					
MAXIMUM PARTICLE SIZE				MICRONS	
MINIMUM PARTICLE SIZE				MICRONS	
SIZE OF PARTICLES TO BE REMOVED <u>99.97% OF .3 MICRONS PARTICLES</u>				MICRONS	
QUANTITY OF PARTICLES TO BE REMOVED				# / HR	
MECHANICAL DESIGN					
DESIGN PRESSURE <u>2.5/-4</u> PSIG		DESIGN TEMPERATURE <u>150</u> °F		CORROSION ALLOWANCE <u>1/16"</u>	
CODES: ASME (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>) STAMP (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>) OTHER <u>NUCLEAR GRADE</u>					
MATERIALS OF CONSTRUCTION		*CONNECTIONS	NO	SIZE	RATING
FILTER CASE	<u>304L SS</u>	INLET	<u>1</u>	<u>3"</u>	<u>150#</u>
FILTER COVER	<u>304L SS</u>	OUTLET	<u>1</u>	<u>3"</u>	<u>150#</u>
FILTER ELEMENT SUPPORTS	<u>304L SS</u>	VENT			
FILTER CASE SUPPORTS		DRAIN			
FILTER CONNECTIONS	<u>304L SS</u>	INSTRUMENTS			
ELEMENTS	<u>NUCLEAR GRADE</u>				
GASKETS					
*ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED					
FILTER COVER TYPE (THRU BOLTED-ON <input type="checkbox"/> , SWING BOLTED-ON <input type="checkbox"/> , CLAMP-ON <input type="checkbox"/> , SCREWED <input type="checkbox"/> , SPECIAL <input type="checkbox"/> , - SEE NOTES)					
DAVIT (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>): FILTER CASE SUPPORTS (YES <input checked="" type="checkbox"/>) (NO <input type="checkbox"/>) MINIMUM HEIGHT					
SANDBLAST (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>): PAINT PRIMER (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>)					
DATA BY VENDORS					
MFR			TYPE NO		
NO REQ'D			NO OPERATING		
NO ELEMENTS EACH FILTER			NO SPARE		
SIZE			"O.D. x "STR: MATERIAL		
TOTAL ELEMENT DIRT HOLDING CAPACITY			CU FT: SURFACE SQ FT		
CLEAN PRESSURE DROP			PSI: SHIPPING WEIGHT		
DESCRIBE METHOD OF REMOVING ELEMENTS:					
IS DIMENSIONAL OUTLINE INCLUDED (YES <input type="checkbox"/>) (NO <input type="checkbox"/>) IS FILTER IN ACCORD WITH SPECS (YES <input type="checkbox"/>) (NO <input type="checkbox"/>)					
NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS. (2) INLET LINE TO HEPA FILTER IS HEATED TO PREVENT CONDENSATE COLLECTION. TEMPERATURE AT GAS ENTERING HEPA IS INFLUENCED BY FLOW THROUGH HEATED ZONE. MAXIMUM FLOW/LOW TEMPERATURE AND LOW FLOW/MAXIMUM TEMPERATURE CASES CONSIDERED.					
105\OS\101\204\84571925.001\WP51-01/25/93 4:11pm			SAFETY CLASSIFICATION <u>3</u>		

ATTACHMENT A

FLUOR DANIEL DATA SHEET U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 HEPA FILTERS	NO.	BY DATE	REVISION	SHEET NO. P33B-DS-5	REV. 0
	▲			DATE 12-18-89	CONTRACT 845734
	▲			TAG NO. FH-520-003	
	▲			SPECIFICATION SECT. NO. 15896	
	▲			FOR CLIENT USE	
	▲			ORIG BY M.W. Bergeron	CHK'D SSL

TITLE <u>ORGANIC ACID DRAIN CATCH TANK HEPA FILTER</u>							
NO UNITS REQ'D <u>1</u> NO UNITS OPERATING <u>1</u> SPARE <u>0</u> TYPE (HORIZONTAL <u> </u>) (VERTICAL <u>X</u>)							
TYPE ELEMENT (THROW - AWAY <u>X</u>) (CLEANABLE <u> </u>) OTHER <u>NUCLEAR GRADE</u>							
PROCESS DESIGN							
NAME OF FLUID FILTERED <u>AIR</u>							
QUANTITY FLUID FILTERED	<u>211.5</u>	<u>19.8</u>	} NOTE 2	# / HR			
OPERATING PRESSURE	<u>-0.2</u>	<u>- 0.2</u>		PSIG			
OPERATING TEMPERATURE	<u>77</u>	<u>220</u>		°F			
DENSITY @ OPER TEMP	<u>0.070</u>	<u>0.055</u>		LB / FT ³			
VISCOSITY @ OPER TEMP	<u>0.018</u>	<u>0.021</u>		C _p			
ALLOWABLE PRESSURE DROP ΔP	<u>1.0</u>	<u>5.0</u>		"H ₂ O			
NAME OF PARTICLES REMOVED <u>PARTICLES CONTAMINATED WITH RADIOACTIVE COMPONENTS</u>							
MAXIMUM PARTICLE SIZE					MICRONS		
MINIMUM PARTICLE SIZE					MICRONS		
SIZE OF PARTICLES TO BE REMOVED	<u>99.97% OF .3 MICRONS AND LARGER</u>				MICRONS		
QUANTITY OF PARTICLES TO BE REMOVED					# / HR		
MECHANICAL DESIGN							
DESIGN PRESSURE <u>2.5/-0.4</u> PSIG		DESIGN TEMPERATURE <u>150</u> °F		CORROSION ALLOWANCE <u>1/8"</u>			
CODES: ASME (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>)		STAMP (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>)		OTHER <u>NUCLEAR GRADE</u>			
MATERIALS OF CONSTRUCTION							
FILTER CASE	<u>316L SS</u>	*CONNECTIONS		NO	SIZE	RATING	
FILTER COVER	<u>316L SS</u>			INLET	<u>1</u>	<u>3"</u>	<u>150 #</u>
FILTER ELEMENT SUPPORTS	<u>316L SS</u>			OUTLET	<u>1</u>	<u>3"</u>	<u>150 #</u>
FILTER CASE SUPPORTS				VENT			
FILTER CONNECTIONS	<u>316L SS</u>			DRAIN			
ELEMENTS	<u>NUCLEAR GRADE</u>			INSTRUMENTS			
GASKETS	<u>HC00H RESISTANT</u>						
*ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED							
FILTER COVER TYPE (THRU BOLTED-ON <input checked="" type="checkbox"/>) SWING BOLTED-ON <input type="checkbox"/>) CLAMP-ON <input type="checkbox"/>) SCREWED <input type="checkbox"/>) SPECIAL <input type="checkbox"/>) - SEE NOTES							
DAVIT (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>) FILTER CASE SUPPORTS (YES <input checked="" type="checkbox"/>) (NO <input type="checkbox"/>) MINIMUM HEIGHT <u> </u>							
SANDBLAST (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>) PAINT PRIMER (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>) <u> </u>							
DATA BY VENDORS							
MFR <u> </u> TYPE NO <u> </u>							
NO REQ'D <u> </u> NO OPERATING <u> </u> NO SPARE <u> </u>							
NO ELEMENTS EACH FILTER <u> </u> SIZE <u> </u> "O.D. <u> </u> x <u> </u> "STR: MATERIAL <u> </u>							
TOTAL ELEMENT DIRT HOLDING CAPACITY <u> </u> CU FT: <u> </u> SURFACE <u> </u> SQ FT							
CLEAN PRESSURE DROP <u> </u> PSI: SHIPPING WEIGHT <u> </u>							
DESCRIBE METHOD OF REMOVING ELEMENTS: <u> </u>							
IS DIMENSIONAL OUTLINE INCLUDED (YES <input type="checkbox"/>) (NO <input type="checkbox"/>) IS FILTER IN ACCORD WITH SPECS (YES <input type="checkbox"/>) (NO <input type="checkbox"/>)							
NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS. (2) INLET LINE TO HEPA FILTER IS HEATED TO PREVENT CONDENSATE COLLECTION. TEMPERATURE AT GAS ENTERING HEPA IS INFLUENCED BY FLOW THROUGH HEATED ZONE. MAXIMUM FLOW/LOW TEMPERATURE AND LOW FLOW/MAXIMUM TEMPERATURE CASES CONSIDERED.							
					SAFETY CLASSIFICATION <u>3</u>		
105\OS\101\204\84571926.001\WP51\01\25\93 4:12pm							

A vertical strip of ten different typewriter fonts, ranging from a simple sans-serif to a highly decorative, calligraphic script.

ATTACHMENT A

FLUOR DANIEL DATA SHEET U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 ROUGHING FILTERS	NO.	BY DATE	REVISION	SHEET NO. P33B-DS-7	REV. 0
	▲				
	▲				
	▲				
	▲				
	▲				
				DATE 07-06-89	CONTRACT 845734
				TAG NO. FL-540-001	
				SPECIFICATION SECT. NO. 15896	
				FOR CLIENT USE	
		ORIG BY J. Janzen	CHK'D SSL	APPR'D	

DES FEED TANK ROUGHING FILTER					
TITLE _____					
NO UNITS REQ'D <u>1</u> NO UNITS OPERATING <u>1</u> SPARE _____ TYPE (HORIZONTAL _____) (VERTICAL <u>X</u>)					
TYPE ELEMENT (THROW - AWAY <u>X</u>) (CLEANABLE _____) OTHER _____					
PROCESS DESIGN					
NAME OF FLUID FILTERED <u>DIATOMACEOUS EARTH DUST FROM VENT STREAM</u>					
QUANTITY FLUID FILTERED <u>234 (55 ACFM)</u> #/HR					
OPERATING PRESSURE <u>- 0.1</u> PSIG					
OPERATING TEMPERATURE <u>77</u> °F					
DENSITY @ OPER TEMP <u>0.071</u> LB / FT ³					
VISCOSITY @ OPER TEMP _____ C _P					
ALLOWABLE PRESSURE DROP <u>1.0 Clean, 5.0 Dirty</u> "H ₂ O					
NAME OF PARTICLES REMOVED <u>DE DUST</u>					
MAXIMUM PARTICLE SIZE <u>See Note 2</u> MICRONS					
MINIMUM PARTICLE SIZE <u>See Note 2</u> MICRONS					
SIZE OF PARTICLES TO BE REMOVED <u>See Note 2</u> MICRONS					
QUANTITY OF PARTICLES TO BE REMOVED <u>See Note 2</u> # / HR					
MECHANICAL DESIGN					
DESIGN PRESSURE <u>5/-0.4</u> PSIG DESIGN TEMPERATURE <u>150</u> °F CORROSION ALLOWANCE <u>1/16" TOTAL</u>					
CODES: ASME (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>) STAMP (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>) OTHER _____					
MATERIALS OF CONSTRUCTION					
FILTER CASE	304L SS	*CONNECTIONS	NO	SIZE	RATING
FILTER COVER	304L SS	INLET	1	3"	150#
FILTER ELEMENT SUPPORTS	304L SS	OUTLET	1	3"	150#
FILTER CASE SUPPORTS		VENT	N/A		
FILTER CONNECTIONS	304L SS	DRAIN	N/A		
ELEMENTS		INSTRUMENTS	2	1/2"	NPT(F)
GASKETS					
*ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED					
FILTER COVER TYPE (THRU BOLTED-ON <input type="checkbox"/> , SWING BOLTED-ON <input type="checkbox"/> , CLAMP-ON <input type="checkbox"/> , SCREWED <input type="checkbox"/> , SPECIAL <input type="checkbox"/> , - SEE NOTES)					
DAVIT (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>): FILTER CASE SUPPORTS (YES <input checked="" type="checkbox"/>) (NO <input type="checkbox"/>) MINIMUM HEIGHT _____					
SANDBLAST (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>): PAINT PRIMER (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>) _____					
DATA BY VENDORS					
MFR _____ TYPE NO _____					
NO REQ'D _____: NO OPERATING _____: NO SPARE _____					
NO ELEMENTS EACH FILTER _____: SIZE _____ "O.D. _____ x _____ "STR: MATERIAL _____					
TOTAL ELEMENT DIRT HOLDING CAPACITY _____ CU FT: _____ SURFACE _____ SQ FT					
CLEAN PRESSURE DROP _____ PSI: SHIPPING WEIGHT _____					
DESCRIBE METHOD OF REMOVING ELEMENTS: _____					
IS DIMENSIONAL OUTLINE INCLUDED (YES <input type="checkbox"/>) (NO <input type="checkbox"/>) IS FILTER IN ACCORD WITH SPECS (YES <input type="checkbox"/>) (NO <input type="checkbox"/>)					
NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS.					
(2) MUST MEET A MINIMUM GROUP III ASHRAE 52-76 EFFICIENT RATING					
105\OS\101204\84571981.001\WP51\01\25\93 4:14pm					SAFETY CLASSIFICATION <u>3</u>

ATTACHMENT A

FLUOR DANIEL DATA SHEET U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 ROUGHING FILTERS	NO	BY DATE	REVISION	SHEET NO. P33B-DS-8	REV. 0
	▲			DATE 08-31-89	CONTRACT 845734
	▲			TAG NO. FL-540-002	
	▲			SPECIFICATION SECT. NO. 15896	
	▲			FOR CLIENT USE	
	▲			ORIG BY Q.B. Ngo	CHK'D SSL

TITLE <u>ZEOLITE SLURRY FEED TANK ROUGHING FILTER</u>	
NO UNITS REQ'D <u>1</u>	NO UNITS OPERATING <u>1</u> SPARE _____
TYPE ELEMENT (THROW - AWAY <u>X</u>) (CLEANABLE _____) OTHER _____	
PROCESS DESIGN	
NAME OF FLUID FILTERED <u>ZEOLITE DUST FROM CV VENT STREAM</u>	
QUANTITY FLUID FILTERED <u>234 (55 ACFM)</u>	#/HR
OPERATING PRESSURE <u>- 0.1</u>	PSIG
OPERATING TEMPERATURE <u>77</u>	°F
DENSITY @ OPER TEMP <u>0.071</u>	LB / FT ³
VISCOSITY @ OPER TEMP _____	Cp
ALLOWABLE PRESSURE DROP <u>ΔP 1.0 Clean, 5.0 Dirty</u>	"H ₂ O
NAME OF PARTICLES REMOVED <u>ZEOLITE POWDER</u>	
MAXIMUM PARTICLE SIZE <u>See Note 2</u>	MICRONS
MINIMUM PARTICLE SIZE <u>See Note 2</u>	MICRONS
SIZE OF PARTICLES TO BE REMOVED <u>See Note 2</u>	MICRONS
QUANTITY OF PARTICLES TO BE REMOVED <u>See Note 2</u>	# / HR
MECHANICAL DESIGN	
DESIGN PRESSURE <u>5/-0.4</u> PSIG	DESIGN TEMPERATURE <u>150</u> °F
CORROSION ALLOWANCE <u>1/16"</u>	
CODES: ASME (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>) STAMP (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>) OTHER _____	
MATERIALS OF CONSTRUCTION	*CONNECTIONS
FILTER CASE <u>304L SS</u>	INLET <u>1</u> <u>3"</u> <u>150#</u>
FILTER COVER <u>304L SS</u>	OUTLET <u>1</u> <u>3"</u> <u>150#</u>
FILTER ELEMENT SUPPORTS <u>304L SS</u>	VENT <u>N/A</u> _____
FILTER CASE SUPPORTS _____	DRAIN <u>N/A</u> _____
FILTER CONNECTIONS <u>304L SS</u>	INSTRUMENTS <u>2</u> <u>1/2"</u> <u>NPT(F)</u>
ELEMENTS _____	_____
GASKETS _____	_____
*ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED	
FILTER COVER TYPE (THRU BOLTED-ON <input type="checkbox"/> , SWING BOLTED-ON <input type="checkbox"/> , CLAMP-ON <input type="checkbox"/> , SCREWED <input type="checkbox"/> , SPECIAL <input type="checkbox"/> , - SEE NOTES)	
DAVIT (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>) : FILTER CASE SUPPORTS (YES <input checked="" type="checkbox"/>) (NO <input type="checkbox"/>) MINIMUM HEIGHT _____	
SANDBLAST (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>) : PAINT PRIMER (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>) _____	
DATA BY VENDORS	
MFR _____	TYPE NO _____
NO REQ'D _____ : NO OPERATING _____ : NO SPARE _____	
NO ELEMENTS EACH FILTER _____ : SIZE _____ "O.D. _____ x _____ "STR: MATERIAL _____	
TOTAL ELEMENT DIRT HOLDING CAPACITY _____ CU FT: SURFACE _____ SQ FT	
CLEAN PRESSURE DROP _____ PSI: SHIPPING WEIGHT _____	
DESCRIBE METHOD OF REMOVING ELEMENTS: _____	
IS DIMENSIONAL OUTLINE INCLUDED (YES <input type="checkbox"/>) (NO <input type="checkbox"/>) IS FILTER IN ACCORD WITH SPECS (YES <input type="checkbox"/>) (NO <input type="checkbox"/>)	
NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS.	
(2) MUST MEET A MINIMUM GROUP III ASHRAE 52-76 EFFICIENCY RATING.	
SAFETY CLASSIFICATION <u>3</u>	

105\OS\101\204\84571906.001\WP51\01\25\83 4:15pm

ATTACHMENT A

FLUOR DANIEL DATA SHEET U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 ROUGHING FILTERS	NO.	BY DATE	REVISION	SHEET NO. P33B-DS-9	REV. 0
	△			DATE 05-06-90	CONTRACT 845734
	△			TAG NO. FL-540-003	
	△			SPECIFICATION SECT. NO. 15896	
	△			FOR CLIENT USE	
	△			ORIG BY S.S. Lee	CHK'D KJM

TITLE <u>DECON SOLUTION MAKEUP TANK ROUGHING FILTER</u>	
NO UNITS REQ'D <u>1</u>	NO UNITS OPERATING <u>1</u> SPARE _____ TYPE (HORIZONTAL _____) (VERTICAL <u>X</u>)
TYPE ELEMENT (THROW - AWAY <u>X</u>) (CLEANABLE _____) OTHER _____	

PROCESS DESIGN	
NAME OF FLUID FILTERED <u>TRISODIUM PHOSPHATE FROM VENT SYSTEM</u>	
QUANTITY FLUID FILTERED <u>234.3</u>	#/HR
OPERATING PRESSURE <u>- 0.1</u>	PSIG
OPERATING TEMPERATURE <u>77</u>	°F
DENSITY @ OPER TEMP <u>0.071</u>	LB / FT ³
VISCOSITY @ OPER TEMP _____	C _p
ALLOWABLE PRESSURE DROP ΔP <u>1.0 Clean, 5.0 Dirty</u>	"H ₂ O
NAME OF PARTICLES REMOVED <u>TSP (TRISODIUM PHOSPHATE)</u>	
MAXIMUM PARTICLE SIZE <u>See Note 2</u>	MICRONS
MINIMUM PARTICLE SIZE <u>See Note 2</u>	MICRONS
SIZE OF PARTICLES TO BE REMOVED <u>See Note 2</u>	MICRONS
QUANTITY OF PARTICLES TO BE REMOVED <u>See Note 2</u>	# / HR

MECHANICAL DESIGN	
DESIGN PRESSURE <u>5/-0.4</u> PSIG	DESIGN TEMPERATURE <u>150</u> °F
CORROSION ALLOWANCE <u>1/16"</u>	
CODES: ASME (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>)	STAMP (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>) OTHER _____

MATERIALS OF CONSTRUCTION		*CONNECTIONS	NO	SIZE	RATING
FILTER CASE	<u>304L SS</u>	INLET	<u>1</u>	<u>3"</u>	<u>150#</u>
FILTER COVER	<u>304L SS</u>	OUTLET	<u>1</u>	<u>3"</u>	<u>150#</u>
FILTER ELEMENT SUPPORTS	<u>304L SS</u>	VENT	<u>N/A</u>		
FILTER CASE SUPPORTS		DRAIN	<u>N/A</u>		
FILTER CONNECTIONS	<u>304L SS</u>	INSTRUMENTS	<u>2</u>	<u>1/2"</u>	<u>NPT(F)</u>
ELEMENTS					
GASKETS					

*ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED

DAVT (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>)	FILTER CASE SUPPORTS (YES <input checked="" type="checkbox"/>) (NO <input type="checkbox"/>)	MINIMUM HEIGHT _____
SANDBLAST (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>)	PAINT PRIMER (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>)	_____

DATA BY VENDORS	
MFR _____	TYPE NO _____
NO REQ'D _____	NO OPERATING _____
NO SPARE _____	
NO ELEMENTS EACH FILTER _____	SIZE _____ "O.D. _____ x _____ "STR: MATERIAL _____
TOTAL ELEMENT DIRT HOLDING CAPACITY _____ CU FT:	SURFACE _____ SQ FT
CLEAN PRESSURE DROP _____ PSI:	SHIPPING WEIGHT _____
DESCRIBE METHOD OF REMOVING ELEMENTS: _____	

IS DIMENSIONAL OUTLINE INCLUDED (YES <input type="checkbox"/>) (NO <input type="checkbox"/>)	IS FILTER IN ACCORD WITH SPECS (YES <input type="checkbox"/>) (NO <input type="checkbox"/>)
NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS.	
(2) MUST MEET A MINIMUM GROUP III ASHRAE 52-76 EFFICIENCY RATING.	

105\OS\101\204\84571907.001\WP51\01\25\93 4:17pm	SAFETY CLASSIFICATION <u>3</u>
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ATTACHMENT A



FLUOR DANIEL

DATA SHEET

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

ROUGHING FILTERS

NO.	BY	REVISION	SHEET NO.	REV.
	DATE		P33B-DS-10	0
			DATE	CONTRACT
			05-06-90	845734
			TAG NO.	FL-540-004
			SPECIFICATION SECT. NO.	15896
			FOR CLIENT USE	
	ORIG BY	CHK'D	APPR'D	
	S.S. Lee	KJM		

TITLE OXALIC ACID DECON MAKEUP TANK ROUGHING FILTER

NO UNITS REQ'D 1 NO UNITS OPERATING 1 SPARE TYPE (HORIZONTAL) (VERTICAL X)

TYPE ELEMENT (THROW - AWAY) (CLEANABLE) OTHER

PROCESS DESIGN

NAME OF FLUID FILTERED OXALIC ACID POWDER FROM VENT SYSTEM

QUANTITY FLUID FILTERED 234.3 (MAX) #/HR

OPERATING PRESSURE - 0.1 PSIG

OPERATING TEMPERATURE 77 °F

DENSITY @ OPER TEMP 0.071 LB / FT³

VISCOSITY @ OPER TEMP C_p

ALLOWABLE PRESSURE DROP 1.0 Clean, 5.0 Dirty "H₂O

NAME OF PARTICLES REMOVED OXALIC ACID POWDER

MAXIMUM PARTICLE SIZE See Note 2 MICRONS

MINIMUM PARTICLE SIZE See Note 2 MICRONS

SIZE OF PARTICLES TO BE REMOVED See Note 2 MICRONS

QUANTITY OF PARTICLES TO BE REMOVED See Note 2 # / HR

MECHANICAL DESIGN

DESIGN PRESSURE 5/-0.4 PSIG DESIGN TEMPERATURE 150 °F CORROSION ALLOWANCE 1/16

CODES: ASME (YES ☐) (NO ☒) STAMP (YES ☐) (NO ☒) OTHER

MATERIALS OF CONSTRUCTION

*CONNECTIONS

			NO	SIZE	RATING
FILTER CASE	304L SS	INLET	1	3"	150#
FILTER COVER	304L SS	OUTLET	1	3"	150#
FILTER ELEMENT SUPPORTS	304L SS	VENT	N/A		
FILTER CASE SUPPORTS		DRAIN	N/A		
FILTER CONNECTIONS	304L SS	INSTRUMENTS	2	1/2"	NPT(F)
ELEMENTS					
GASKETS					

*ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED

FILTER COVER TYPE (THRU BOLTED-ON ☐) SWING BOLTED-ON ☐) CLAMP-ON ☐) SCREWED ☐) SPECIAL ☐) - SEE NOTES

DAVT (YES ☐) (NO ☒) FILTER CASE SUPPORTS (YES ☒) (NO ☐) MINIMUM HEIGHT

SANDBLAST (YES ☐) (NO ☒) PAINT PRIMER (YES ☐) (NO ☒)

DATA BY VENDORS

MFR TYPE NO

NO REQ'D NO OPERATING NO SPARE

NO ELEMENTS EACH FILTER SIZE "O.D. x "STR: MATERIAL

TOTAL ELEMENT DIRT HOLDING CAPACITY CU FT: SURFACE SQ FT

CLEAN PRESSURE DROP PSI: SHIPPING WEIGHT

DESCRIBE METHOD OF REMOVING ELEMENTS:

IS DIMENSIONAL OUTLINE INCLUDED (YES ☐) (NO ☐) IS FILTER IN ACCORD WITH SPECS (YES ☐) (NO ☐)

NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS.

(2) MUST MEET A MINIMUM GROUP III ASHRAE 52-76 EFFICIENCY RATING.

SAFETY CLASSIFICATION 3

105\OS\101\204\84571908.001\WP51\01\25\93 4:26pm

ATTACHMENT A



FLUOR DANIEL

DATA SHEET

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

ROUGHING FILTERS

NO.	BY DATE	REVISION	SHEET NO. P33B-DS-11	REV. 0
△			DATE 05-06-90	CONTRACT 845734
△			TAG NO. FL-540-005	
△			SPECIFICATION SECT. NO. 15896	
△			FOR CLIENT USE	
△			ORIG BY S.S. Lee	CHK'D KJM
△			APPR'D	

TITLE **KMnO₄ MAKE UP TANK ROUGHING FILTER**

NO UNITS REQ'D 1 NO UNITS OPERATING 1 SPARE _____ TYPE (HORIZONTAL _____) (VERTICAL X)

TYPE ELEMENT (THROW - AWAY X) (CLEANABLE _____) OTHER _____

PROCESS DESIGN

NAME OF FLUID FILTERED **KMnO₄ POWDER FROM VENT SYSTEM**

QUANTITY FLUID FILTERED 234.3 #/HR

OPERATING PRESSURE - 0.1 PSIG

OPERATING TEMPERATURE 77 °F

DENSITY @ OPER TEMP 0.071 LB / FT³

VISCOSITY @ OPER TEMP _____ C_p

ALLOWABLE PRESSURE DROP ΔP **1.0 Clean, 5.0 Dirty** "H₂O

NAME OF PARTICLES REMOVED **KMnO₄ DUST**

MAXIMUM PARTICLE SIZE See Note 2 MICRONS

MINIMUM PARTICLE SIZE See Note 2 MICRONS

SIZE OF PARTICLES TO BE REMOVED See Note 2 MICRONS

QUANTITY OF PARTICLES TO BE REMOVED See Note 2 # / HR

MECHANICAL DESIGN

DESIGN PRESSURE 5/-0.4 PSIG DESIGN TEMPERATURE 150 °F CORROSION ALLOWANCE 1/16"

CODES: ASME (YES ☐) (NO ☒) STAMP (YES ☐) (NO ☒) OTHER _____

MATERIALS OF CONSTRUCTION

MATERIALS OF CONSTRUCTION		*CONNECTIONS	NO	SIZE	RATING
FILTER CASE	<u>304L SS</u>	INLET	<u>1</u>	<u>3"</u>	<u>150#</u>
FILTER COVER	<u>304L SS</u>	OUTLET	<u>1</u>	<u>3"</u>	<u>150#</u>
FILTER ELEMENT SUPPORTS	<u>304L SS</u>	VENT	<u>N/A</u>		
FILTER CASE SUPPORTS		DRAIN	<u>N/A</u>		
FILTER CONNECTIONS	<u>304L SS</u>	INSTRUMENTS	<u>2</u>	<u>1/2"</u>	<u>NPT(F)</u>
ELEMENTS					
GASKETS					

*ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED

FILTER COVER TYPE (THRU BOLTED-ON ☐) SWING BOLTED-ON ☐) CLAMP-ON ☐) SCREWED ☐) SPECIAL ☐) - SEE NOTES)DAVIT (YES ☐) (NO ☒) FILTER CASE SUPPORTS (YES ☒) (NO ☐) MINIMUM HEIGHT _____SANDBLAST (YES ☐) (NO ☒) PAINT PRIMER (YES ☐) (NO ☒) _____

DATA BY VENDORS

MFR _____ TYPE NO _____

NO REQ'D _____ NO OPERATING _____ NO SPARE _____

NO ELEMENTS EACH FILTER _____ SIZE _____ "O.D. _____ x _____ "STR: MATERIAL _____

TOTAL ELEMENT DIRT HOLDING CAPACITY _____ CU FT: _____ SURFACE _____ SQ FT

CLEAN PRESSURE DROP _____ PSI: SHIPPING WEIGHT _____

DESCRIBE METHOD OF REMOVING ELEMENTS: _____

IS DIMENSIONAL OUTLINE INCLUDED (YES ☐) (NO ☐) IS FILTER IN ACCORD WITH SPECS (YES ☐) (NO ☐)

NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS.

(2) MUST MEET A MINIMUM GROUP III ASHRAE 52-76 EFFICIENCY RATING.

SAFETY CLASSIFICATION 3

105\OS\101\204\84571909.001\WP51\01\25\93 4:28pm

ATTACHMENT A


**FLUOR DANIEL
DATA SHEET**

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

ROUGHING FILTERS

NO.	REVISION	SHEET NO.	REV.
△		P33B-DS-12	0
△		DATE	CONTRACT
△		05-06-90	845734
△		TAG NO.	
△		FL-540-006	
△		SPECIFICATION SECT NO	
△		15896	
△		ORIG BY	CHK'D
△		S.S. Lee	K.M.
△		APPR'D	

TITLE NaNO₂ MAKE UP TANK ROUGHING FILTER

NO UNITS REQ'D 1 NO UNITS OPERATING 1 SPARE TYPE (HORIZONTAL) (VERTICAL X)

TYPE ELEMENT (THROW - AWAY →) (CLEANABLE) OTHER

PROCESS DESIGN

NAME OF FLUID FILTERED NaNO₂ POWDER FROM VENT SYSTEM

QUANTITY FLUID FILTERED 234.3 #/HR

OPERATING PRESSURE - 0.1 PSIG

OPERATING TEMPERATURE 77 °F

DENSITY @ OPER TEMP 0.071 LB/FT³

VISCOSITY @ OPER TEMP C_p

ALLOWABLE PRESSURE DROP AP 1.0 Clean, 5.0 Dirty "H₂O

NAME OF PARTICLES REMOVED NaNO₂ DUST

MAXIMUM PARTICLE SIZE See Note 2 lb / HR

MINIMUM PARTICLE SIZE See Note 2 lb / HR

SIZE OF PARTICLES REMOVED See Note 2

QUANTITY PARTICLES TO BE REMOVED See Note 2 lb / HR

MECHANICAL DESIGN

DESIGN PRESSURE 5/-0.4 PSIG DESIGN TEMPERATURE 150 °F CORROSION ALLOWANCE 1/16"

CODES: ASME (YES ☐) (NO ☒) STAMP (YES ☐) (NO ☒) OTHER

MATERIALS OF CONSTRUCTION		*CONNECTIONS	NO	SIZE	RATING
FILTER CASE	304L SS	INLET	1	3"	150#
FILTER COVER	304L SS	OUTLET	1	3"	150#
FILTER ELEMENT SUPPORTS	304L SS	VENT	N/A		
FILTER CASE SUPPORTS		DRAIN	N/A		
FILTER CONNECTIONS	304L SS	INSTRUMENTS	2	1/2"	NPT(F)
ELEMENTS					
GASKETS					

*ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED

FILTER COVER TYPE (THRU BOLTED-ON ☐, SWING BOLTED-ON ☐, CLAMP-ON ☐, SCREWED ☐, SPECIAL ☐ - SEE NOTES)

DAVIT (YES ☐) (NO ☒): FILTER CASE SUPPORTS (YES ☒) (NO ☐) MINIMUM HEIGHT

SANDBLAST (YES ☐) (NO ☒): PAINT PRIMER (YES ☐) (NO ☒)

DATA BY VENDORS

MFR TYPE NO

NO REQ'D : NO OPERATING : NO SPARE

NO ELEMENTS EACH FILTER : SIZE "O.D. x "STR: MATERIAL

TOTAL ELEMENT DIRT HOLDING CAPACITY CU FT: SURFACE SQ FT

CLEAN PRESSURE DROP PSI: SHIPPING WEIGHT

DESCRIBE METHOD OF REMOVING ELEMENTS:

IS DIMENSIONAL OUTLINE INCLUDED (YES ☐) (NO ☐) IS FILTER IN ACCORD WITH SPECS (YES ☐) (NO ☐)

NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS.


(2) MUST MEET A MINIMUM GROUP III ASHRAE 52-76 EFFICIENCY RATING.

SAFETY CLASSIFICATION 3

105\OS\101\204\84571910.001\WPS1\01\25\93 4:30pm

9413202.002

ATTACHMENT A

 FLUOR DANIEL DATA SHEET U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 ROUGHING FILTERS	NO.	BY	REVISION	SHEET NO.	REV.
		DATE		P33B-DS-13	0
	△			DATE	CONTRACT
	△			05-06-90	845734
	△			TAG NO.	
	△			FL-540-007	
	△			SPECIFICATION SECT. NO.	
	△			15896	
△			FOR CLIENT USE		
△			ORIG BY	CHK'D	APPR'D
			S.S. Lee	KJM	

TITLE **SUGAR SOLUTION MAKEUP TANK ROUGHING FILTER**

NO UNITS REQ'D 1 NO UNITS OPERATING 1 SPARE _____ TYPE (HORIZONTAL _____) (VERTICAL X)

TYPE ELEMENT (THROW - AWAY _____) (CLEANABLE _____) OTHER _____

PROCESS DESIGN

NAME OF FLUID FILTERED **SUGAR POWDER FROM VENT SYSTEM**

QUANTITY FLUID FILTERED 234.3 #/HR

OPERATING PRESSURE - 0.1 PSIG

OPERATING TEMPERATURE 77 °F

DENSITY @ OPER TEMP 0.071 LB / FT³

VISCOSITY @ OPER TEMP _____ C_p

ALLOWABLE PRESSURE DROP AP **1.0 Clean, 5.0 Dirty** "H₂O

NAME OF PARTICLES REMOVED **SUGAR DUST**

MAXIMUM PARTICLE SIZE See Note 2 MICRONS

MINIMUM PARTICLE SIZE See Note 2 MICRONS

SIZE OF PARTICLES TO BE REMOVED See Note 2 MICRONS

QUANTITY OF PARTICLES TO BE REMOVED See Note 2 # / HR

MECHANICAL DESIGN

DESIGN PRESSURE 5/-0.4 PSIG DESIGN TEMPERATURE 150 °F CORROSION ALLOWANCE 1/16"

CODES: ASME (YES ☐) (NO ☒) STAMP (YES ☐) (NO ☒) OTHER _____

MATERIALS OF CONSTRUCTION		*CONNECTIONS	NO	SIZE	RATING
FILTER CASE	<u>304L SS</u>	INLET	<u>1</u>	<u>3"</u>	<u>150#</u>
FILTER COVER	<u>304L SS</u>	OUTLET	<u>1</u>	<u>3"</u>	<u>150#</u>
FILTER ELEMENT SUPPORTS	<u>304L SS</u>	VENT	<u>N/A</u>		
FILTER CASE SUPPORTS		DRAIN	<u>N/A</u>		
FILTER CONNECTIONS	<u>304L SS</u>	INSTRUMENTS	<u>2</u>	<u>1/2"</u>	<u>NPT(F)</u>
ELEMENTS					
GASKETS					

*ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED

FILTER COVER TYPE (THRU BOLTED-ON ☐, SWING BOLTED-ON ☐, CLAMP-ON ☐, SCREWED ☐, SPECIAL ☐, - SEE NOTES)

DAVIT (YES ☐) (NO ☒): FILTER CASE SUPPORTS (YES ☒) (NO ☐) MINIMUM HEIGHT _____

SANDBLAST (YES ☐) (NO ☒): PAINT PRIMER (YES ☐) (NO ☒) _____

DATA BY VENDORS

MFR _____ TYPE NO _____

NO REQ'D _____: NO OPERATING _____: NO SPARE _____

NO ELEMENTS EACH FILTER _____: SIZE _____ "O.D. _____ x _____ "STR: MATERIAL _____

TOTAL ELEMENT DIRT HOLDING CAPACITY _____ CU FT: _____ SURFACE _____ SQ FT

CLEAN PRESSURE DROP _____ PSI: SHIPPING WEIGHT _____

DESCRIBE METHOD OF REMOVING ELEMENTS: _____

IS DIMENSIONAL OUTLINE INCLUDED (YES ☐) (NO ☐) IS FILTER IN ACCORD WITH SPECS (YES ☐) (NO ☐)

NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS.

(2) MUST MEET A MINIMUM GROUP III ASHRAE 52-76 EFFICIENCY RATING.

SAFETY CLASSIFICATION 3

105\OS\101\204\84571911.001\WP51\01\25\93 4:31pm

ATTACHMENT A

FLUOR DANIEL DATA SHEET U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 ROUGHING FILTERS	NO.	BY DATE	REVISION	SHEET NO. P33B-DS-14	REV. 0
	▲			DATE 05-06-90	CONTRACT 845734
	▲			TAG NO. FL-540-009	
	▲			SPECIFICATION SECT. NO. 15896	
	▲			FOR CLIENT USE	
	▲			ORIG BY S.S. Lee	CHK'D KJM

TITLE <u>KOHIFRIT MODIFIER MAKEUP TANK ROUGHING FILTER</u>			
NO UNITS REQ'D <u>1</u>	NO UNITS OPERATING <u>1</u>	SPARE _____	TYPE (HORIZONTAL _____) (VERTICAL <u>X</u>)
TYPE ELEMENT (THROW - AWAY <u>X</u>) (CLEANABLE _____) OTHER _____			

PROCESS DESIGN	
NAME OF FLUID FILTERED <u>DRY CHEMICAL POWDER FROM VENT SYSTEM</u>	
QUANTITY FLUID FILTERED <u>234.3</u>	#/HR
OPERATING PRESSURE <u>- 0.1</u>	PSIG
OPERATING TEMPERATURE <u>77</u>	°F
DENSITY @ OPER TEMP <u>0.071</u>	LB / FT ³
VISCOSITY @ OPER TEMP _____	Cp
ALLOWABLE PRESSURE DROP <u>ΔP</u> <u>1.0 Clean, 5.0 Dirty</u>	"H ₂ O
NAME OF PARTICLES REMOVED <u>DRY CHEMICAL DUST FROM KOHIFRIT MODIFIER</u>	
MAXIMUM PARTICLE SIZE <u>See Note 2</u>	MICRONS
MINIMUM PARTICLE SIZE <u>See Note 2</u>	MICRONS
SIZE OF PARTICLES TO BE REMOVED <u>See Note 2</u>	MICRONS
QUANTITY OF PARTICLES TO BE REMOVED <u>See Note 2</u>	# / HR

MECHANICAL DESIGN	
DESIGN PRESSURE <u>5/-0.4</u> PSIG	DESIGN TEMPERATURE <u>150</u> °F
CORROSION ALLOWANCE <u>1/16"</u>	
CODES: ASME (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>)	STAMP (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>) OTHER _____

MATERIALS OF CONSTRUCTION		*CONNECTIONS	NO	SIZE	RATING
FILTER CASE	304L SS	INLET	1	3"	150#
FILTER COVER	304L SS	OUTLET	1	3"	150#
FILTER ELEMENT SUPPORTS	304L SS	VENT	N/A		
FILTER CASE SUPPORTS		DRAIN	N/A		
FILTER CONNECTIONS	304L SS	INSTRUMENTS	2	1/2"	NPT(F)
ELEMENTS					
GASKETS					

*ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED

FILTER COVER TYPE (THRU BOLTED-ON <input type="checkbox"/> , SWING BOLTED-ON <input type="checkbox"/> , CLAMP-ON <input type="checkbox"/> , SCREWED <input type="checkbox"/> , SPECIAL <input type="checkbox"/> , - SEE NOTES)	
DAVIT (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>)	FILTER CASE SUPPORTS (YES <input checked="" type="checkbox"/>) (NO <input type="checkbox"/>) MINIMUM HEIGHT _____
SANDBLAST (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>)	PAINT PRIMER (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>) _____

DATA BY VENDORS	
MFR _____	TYPE NO _____
NO REQ'D _____	NO OPERATING _____
NO ELEMENTS EACH FILTER _____	NO SPARE _____
TOTAL ELEMENT DIRT HOLDING CAPACITY _____ CU FT	SIZE _____ "O.D. _____ x _____ "STR: MATERIAL _____
CLEAN PRESSURE DROP _____ PSI	SURFACE _____ SQ FT
SHIPPING WEIGHT _____	
DESCRIBE METHOD OF REMOVING ELEMENTS: _____	
IS DIMENSIONAL OUTLINE INCLUDED (YES <input type="checkbox"/>) (NO <input type="checkbox"/>) IS FILTER IN ACCORD WITH SPECS (YES <input type="checkbox"/>) (NO <input type="checkbox"/>)	
NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS.	
(2) MUST MEET A MINIMUM GROUP III ASHRAE 52-76 EFFICIENCY RATING.	
SAFETY CLASSIFICATION <u>3</u>	

105\OS\101\204\84571912.001\WP51\01/25/93 4:32pm

ATTACHMENT A

FLUOR DANIEL DATA SHEET U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 ROUGHING FILTERS	NO.	BY DATE	REVISION	SHEET NO. P33B-DS-15	REV. 0
	▲			DATE 05-06-90	CONTRACT 845734
	▲			TAG NO. FL-540-010	
	▲			SPECIFICATION SECT. NO. 15896	
	▲			FOR CLIENT USE	
	▲			ORIG BY S.S. Lee	CHK'D KJM

TITLE <u>HNO₃ DECON MAKE-UP TANK ROUGHING FILTER</u>			
NO UNITS REQ'D <u>1</u>	NO UNITS OPERATING <u>1</u>	SPARE _____	TYPE (HORIZONTAL _____) (VERTICAL <u>X</u>)
TYPE ELEMENT (THROW - AWAY <u>X</u>) (CLEANABLE _____) OTHER _____			

PROCESS DESIGN	
NAME OF FLUID FILTERED <u>KMnO₄ POWDER FROM VENT SYSTEM</u>	
QUANTITY FLUID FILTERED <u>234.3</u>	#/HR
OPERATING PRESSURE <u>- 0.1</u>	PSIG
OPERATING TEMPERATURE <u>77</u>	°F
DENSITY @ OPER TEMP <u>0.071</u>	LB / FT ³
VISCOSITY @ OPER TEMP _____	Cp
ALLOWABLE PRESSURE DROP ΔP <u>1.0 Clean, 5.0 Dirty</u>	"H ₂ O
NAME OF PARTICLES REMOVED <u>KMnO₄ DUST</u>	
MAXIMUM PARTICLE SIZE <u>See Note 2</u>	MICRONS
MINIMUM PARTICLE SIZE <u>See Note 2</u>	MICRONS
SIZE OF PARTICLES TO BE REMOVED <u>See Note 2</u>	MICRONS
QUANTITY OF PARTICLES TO BE REMOVED <u>See Note 2</u>	# / HR

MECHANICAL DESIGN	
DESIGN PRESSURE <u>5/-0.4</u> PSIG	DESIGN TEMPERATURE <u>150</u> °F
CORROSION ALLOWANCE <u>1/16"</u>	
CODES: ASME (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>) STAMP (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>) OTHER _____	

MATERIALS OF CONSTRUCTION		*CONNECTIONS	NO	SIZE	RATING
FILTER CASE	<u>304L SS</u>	INLET	<u>1</u>	<u>3"</u>	<u>150#</u>
FILTER COVER	<u>304L SS</u>	OUTLET	<u>1</u>	<u>3"</u>	<u>150#</u>
FILTER ELEMENT SUPPORTS	<u>304L SS</u>	VENT	<u>N/A</u>		
FILTER CASE SUPPORTS		DRAIN	<u>N/A</u>		
FILTER CONNECTIONS	<u>304L SS</u>	INSTRUMENTS	<u>2</u>	<u>1/2"</u>	<u>NPT(F)</u>
ELEMENTS					
GASKETS					

*ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED

FILTER COVER TYPE (THRU BOLTED-ON <input type="checkbox"/> , SWING BOLTED-ON <input type="checkbox"/> , CLAMP-ON <input type="checkbox"/> , SCREWED <input type="checkbox"/> , SPECIAL <input type="checkbox"/> , - SEE NOTES)	
DAVIT (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>)	FILTER CASE SUPPORTS (YES <input checked="" type="checkbox"/>) (NO <input type="checkbox"/>)
SANDBLAST (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>)	PAINT PRIMER (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>)

DATA BY VENDORS	
MFR _____	TYPE NO _____
NO REQ'D _____	NO OPERATING _____
NO SPARE _____	
NO ELEMENTS EACH FILTER _____	SIZE _____ "O.D. _____ x _____ "STR: MATERIAL _____
TOTAL ELEMENT DIRT HOLDING CAPACITY _____ CU FT:	SURFACE _____ SQ FT
CLEAN PRESSURE DROP _____ PSI:	SHIPPING WEIGHT _____
DESCRIBE METHOD OF REMOVING ELEMENTS: _____	
IS DIMENSIONAL OUTLINE INCLUDED (YES <input type="checkbox"/>) (NO <input type="checkbox"/>) IS FILTER IN ACCORD WITH SPECS (YES <input type="checkbox"/>) (NO <input type="checkbox"/>)	
NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS.	
(2) MUST MEET A MINIMUM GROUP III ASHRAE 52-76 EFFICIENCY RATING.	
105\OS\101\204\84571913.001\WP51\01\25\93 4:33pm	

FLUOR DANIEL

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

ROUGHING FILTERS

NO.	BY DATE	REVISION	SHEET NO. P33B-DS-16	REV. 0
▲			DATE 05-06-90	CONTRACT 845734
▲			TAG NO. FL-540-011	
▲			SPECIFICATION SECT NO. 15896	
▲			FOR CLIENT USE	
▲			ORIG BY S.S. Lee	CHK'D KJM
▲			APPR'D	

TITLE **OFF-GAS TREATMENT CHEMICAL FEED TANK ROUGHING FILTER**

NO UNITS REQ'D 1 NO UNITS OPERATING 1 SPARE _____ TYPE (HORIZONTAL) (VERTICAL X)
TYPE ELEMENT (THROW - AWAY X) (CLEANABLE _____) OTHER _____

NAME OF FLUID FILTERED	AIR WITH DRY CHEMICAL DUST	
QUANTITY FLUID FILTERED	234.3	#/HR
OPERATING PRESSURE	- 0.1	PSIG
OPERATING TEMPERATURE	77	°F
DENSITY @ OPER TEMP	0.071	LB / FT ³
VISCOSITY @ OPER TEMP		C _p
ALLOWABLE PRESSURE DROP ΔP	1.0 Clean, 5.0 Dirty	"H ₂ O
NAME OF PARTICLES REMOVED	DRY CHEMICAL DUST FROM FEED TANK	
MAXIMUM PARTICLE SIZE	See Note 2	MICRONS
MINIMUM PARTICLE SIZE	See Note 2	MICRONS
SIZE OF PARTICLES TO BE REMOVED	See Note 2	MICRONS
QUANTITY OF PARTICLES TO BE REMOVED	See Note 2	# / HR

DESIGN PRESSURE 5/0.4 PSIG DESIGN TEMPERATURE 150 °F CORROSION ALLOWANCE 1/16"
 CODES: ASME (YES ☐) (NO ☒) STAMP (YES ☐) (NO ☒) OTHER _____

MATERIALS OF CONSTRUCTION		*CONNECTIONS	NO	SIZE	RATING
FILTER CASE	304L SS	INLET	1	3"	150#
FILTER COVER	304L SS	OUTLET	1	3"	150#
FILTER ELEMENT SUPPORTS	304L SS	VENT	N/A		
FILTER CASE SUPPORTS		DRAIN	N/A		
FILTER CONNECTIONS	304L SS	INSTRUMENTS	2	1/2"	NPT(F)
ELEMENTS					
GASKETS					
		*ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED			

***ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED**

FILTER COVER TYPE (THRU BOLTED-ON ☐, SWING BOLTED-ON ☐, CLAMP-ON ☐, SCREWED ☐, SPECIAL ☐, - SEE NOTES)

DAVIT (YES ☐) (NO ☒): FILTER CASE SUPPORTS (YES ☒) (NO ☐) MINIMUM HEIGHT _____

SANDBLAST (YES ☐) (NO ☒): PAINT PRIMER (YES ☐) (NO ☒):

DATA BY VENDORS

MFR _____ TYPE NO _____

NO REQ'D _____: NO OPERATING _____: NO SPARE _____

NO ELEMENTS EACH FILTER _____ : SIZE _____ 'O.D. _____ x _____ 'STR: MATERIAL _____

TOTAL ELEMENT DIRT HOLDING CAPACITY _____ CU FT: _____ SURFACE _____ SQ FT _____

CLEAN PRESSURE DROP _____ PSI: SHIPPING WEIGHT _____

DESCRIBE METHOD OF REMOVING ELEMENTS: _____

IS DIMENSIONAL OUTLINE INCLUDED (YES ☐) (NO ☐) IS FILTER IN ACCORD WITH SPECS (YES ☐) (NO ☐)

NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS.

(2) MUST MEET A MINIMUM GROUP III ASHRAE 52-76 EFFICIENCY RATING.

SAFETY CLASSIFICATION 3

105\OS\101\204\84571914.001\WP51\01\25\93 4:34pm

ATTACHMENT A

FLUOR DANIEL DATA SHEET U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 ROUGHING FILTERS	NO.	BY DATE	REVISION	SHEET NO. P33B-DS-17	REV. 0
	▲				
	▲				
	▲				
	▲				
	▲				
				DATE 11-28-90	CONTRACT 845734
				TAG NO. FL-540-012	
				SPECIFICATION SECT. NO. 15896	
				FOR CLIENT USE	
		ORIG BY S.S. Lee	CHK'D KJM	APPR'D	

NOHIFRIT MODIFIER FEED TANK ROUGHING FILTER					
TITLE _____					
NO UNITS REQ'D <u>1</u> NO UNITS OPERATING <u>1</u> SPARE _____ TYPE (HORIZONTAL _____) (VERTICAL _____)					
TYPE ELEMENT (THROW - AWAY _____) (CLEANABLE _____) OTHER _____					
PROCESS DESIGN					
NAME OF FLUID FILTERED <u>AIR WITH DRY CHEMICAL DUST</u>					
QUANTITY FLUID FILTERED <u>234.3</u> #/HR					
OPERATING PRESSURE <u>- 0.1</u> PSIG					
OPERATING TEMPERATURE <u>77</u> °F					
DENSITY @ OPER TEMP <u>0.071</u> LB / FT ³					
VISCOSITY @ OPER TEMP _____ Cp					
ALLOWABLE PRESSURE DROP <u>AP</u> <u>1.0 Clean, 5.0 Dirty</u> *H ₂ O					
NAME OF PARTICLES REMOVED <u>DRY CHEMICAL DUST FROM FEED TANK</u>					
MAXIMUM PARTICLE SIZE <u>See Note 2</u> MICRONS					
MINIMUM PARTICLE SIZE <u>See Note 2</u> MICRONS					
SIZE OF PARTICLES TO BE REMOVED <u>See Note 2</u> MICRONS					
QUANTITY OF PARTICLES TO BE REMOVED <u>See Note 2</u> # / HR					
MECHANICAL DESIGN					
DESIGN PRESSURE <u>5/-0.4</u> PSIG DESIGN TEMPERATURE <u>150</u> °F CORROSION ALLOWANCE <u>1/16"</u>					
CODES: ASME (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>) STAMP (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>) OTHER _____					
MATERIALS OF CONSTRUCTION		*CONNECTIONS	NO	SIZE	RATING
FILTER CASE	<u>304L SS</u>	INLET	<u>1</u>	<u>3"</u>	<u>150#</u>
FILTER COVER	<u>304L SS</u>	OUTLET	<u>1</u>	<u>3"</u>	<u>150#</u>
FILTER ELEMENT SUPPORTS	<u>304L SS</u>	VENT	<u>N/A</u>		
FILTER CASE SUPPORTS		DRAIN	<u>N/A</u>		
FILTER CONNECTIONS	<u>304L SS</u>	INSTRUMENTS	<u>2</u>	<u>1/2"</u>	<u>NPT(F)</u>
ELEMENTS					
GASKETS					
*ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED					
FILTER COVER TYPE (THRU BOLTED-ON <input type="checkbox"/> , SWING BOLTED-ON <input type="checkbox"/> , CLAMP-ON <input type="checkbox"/> , SCREWED <input type="checkbox"/> , SPECIAL <input type="checkbox"/> , - SEE NOTES)					
DAVIT (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>): FILTER CASE SUPPORTS (YES <input checked="" type="checkbox"/>) (NO <input type="checkbox"/>) MINIMUM HEIGHT _____					
SANDBLAST (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>): PAINT PRIMER (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>) _____					
DATA BY VENDORS					
MFR _____ TYPE NO _____					
NO REQ'D _____: NO OPERATING _____: NO SPARE _____					
NO ELEMENTS EACH FILTER _____: SIZE _____ "O.D. _____ x _____ "STR: MATERIAL _____					
TOTAL ELEMENT DIRT HOLDING CAPACITY _____ CU FT: SURFACE _____ SQ FT					
CLEAN PRESSURE DROP _____ PSI: SHIPPING WEIGHT _____					
DESCRIBE METHOD OF REMOVING ELEMENTS: _____					
IS DIMENSIONAL OUTLINE INCLUDED (YES <input type="checkbox"/>) (NO <input type="checkbox"/>) IS FILTER IN ACCORD WITH SPECS (YES <input type="checkbox"/>) (NO <input type="checkbox"/>)					
NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS.					
(2) MUST MEET A MINIMUM GROUP III ASHRAE 52-76 EFFICIENCY RATING.					
105\OS\101\204\84571915.001\WP51\01\25\93 4:35pm					SAFETY CLASSIFICATION <u>3</u>

ATTACHMENT A

FLUOR DANIEL DATA SHEET U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 HEPA FILTERS	NO.	BY DATE	REVISION	SHEET NO. P33B-DS-18	REV. 0
	▲			DATE 06-07-90	CONTRACT 845734
	▲			TAG NO. FH-560-001A/B	
	▲			SPECIFICATION SECT. NO. 15896	
	▲			FOR CLIENT USE	
	▲			DRG BY M. Desai	CHK'D K.J.M.

TITLE <u>COLD FEED VENT HEPA FILTER</u>	
NO UNITS REQ'D <u>2</u>	NO UNITS OPERATING <u>1</u> SPARE <u>1</u> TYPE (HORIZONTAL <u> </u>) (VERTICAL <u>X</u>)
TYPE ELEMENT (THROW - AWAY <u>X</u>) (CLEANABLE <u> </u>) OTHER <u> </u>	

PROCESS DESIGN	
NAME OF FLUID FILTERED	<u>AIR</u>
QUANTITY FLUID FILTERED	<u>300 (S.C.F.M.)</u>
OPERATING PRESSURE	<u>- 0.7</u> PSIG
OPERATING TEMPERATURE	<u>77</u> °F
DENSITY @ OPER TEMP	<u>0.075</u> LB / FT ³
VISCOSITY @ OPER TEMP	<u>0.018</u> Cp
ALLOWABLE PRESSURE DROP ΔP	<u>1.0 Clean, 5.0 Dirty</u> *H ₂ O
NAME OF PARTICLES REMOVED	<u>(DRY CHEMICAL DUST FROM FEED TANK)</u>
MAXIMUM PARTICLE SIZE	<u>See Note 2</u> MICRONS
MINIMUM PARTICLE SIZE	<u>See Note 2</u> MICRONS
SIZE OF PARTICLES TO BE REMOVED	<u>See Note 2</u> MICRONS
QUANTITY OF PARTICLES TO BE REMOVED	<u>See Note 2</u> # / HR

MECHANICAL DESIGN	
DESIGN PRESSURE <u>5/FULL VAC</u> PSIG	DESIGN TEMPERATURE <u>150</u> °F CORROSION ALLOWANCE <u> </u>
CODES: ASME (YES <input checked="" type="checkbox"/>) (NO <input type="checkbox"/>) STAMP (YES <input checked="" type="checkbox"/>) (NO <input type="checkbox"/>) OTHER <u> </u>	

MATERIALS OF CONSTRUCTION		*CONNECTIONS	NO	SIZE	RATING
FILTER CASE	<u>304L SS</u>	INLET	<u>1</u>	<u>6"</u>	<u>150#</u>
FILTER COVER	<u>304L SS</u>	OUTLET	<u>1</u>	<u>6"</u>	<u>150#</u>
FILTER ELEMENT SUPPORTS	<u>304L SS</u>	VENT			
FILTER CASE SUPPORTS		DRAIN			
FILTER CONNECTIONS	<u>304L SS</u>	INSTRUMENTS	<u>2</u>	<u>1/2"</u>	<u>NPT(F)</u>
ELEMENTS					
GASKETS					

*ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED

FILTER COVER TYPE (THRU BOLTED-ON <input checked="" type="checkbox"/>) SWING BOLTED-ON <input type="checkbox"/>) CLAMP-ON <input type="checkbox"/>) SCREWED <input type="checkbox"/>) SPECIAL <input type="checkbox"/>) - SEE NOTES)	
DAVIT (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>)	FILTER CASE SUPPORTS (YES <input type="checkbox"/>) (NO <input type="checkbox"/>) MINIMUM HEIGHT <u> </u>
SANDBLAST (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>)	PAINT PRIMER (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>)

DATA BY VENDORS	
MFR <u> </u>	TYPE NO <u> </u>
NO REQ'D <u> </u>	NO OPERATING <u> </u> : NO SPARE <u> </u>
NO ELEMENTS EACH FILTER <u> </u>	SIZE <u> </u> *O.D. <u> </u> x <u> </u> *STR: MATERIAL <u> </u>
TOTAL ELEMENT DIRT HOLDING CAPACITY <u> </u> CU FT:	SURFACE <u> </u> SQ FT
CLEAN PRESSURE DROP <u> </u> PSI:	SHIPPING WEIGHT <u> </u>
DESCRIBE METHOD OF REMOVING ELEMENTS: <u> </u>	
IS DIMENSIONAL OUTLINE INCLUDED (YES <input type="checkbox"/>) (NO <input type="checkbox"/>) IS FILTER IN ACCORD WITH SPECS (YES <input type="checkbox"/>) (NO <input type="checkbox"/>)	
NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS.	
(2) MUST MEET A MINIMUM GROUP IV ASHRAE 52-76 EFFICIENCY RATING.	
105\OS\101\204\845719\16.001\WP51\01\25\93 4:35pm	

	SAFETY CLASSIFICATION <u>3</u>
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ATTACHMENT A

FLUOR DANIEL DATA SHEET U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 HEPA FILTERS	NO.	BY DATE	REVISION	SHEET NO. P33B-DS-19	REV. 0
	▲				
	▲				
	▲				
	▲				
	▲				
				DATE 06-07-90	CONTRACT 845734
				TAG NO. FL-580-001	
				SPECIFICATION SECT. NO. 15896	
				FOR CLIENT USE	
		ORIG BY M. Desai	CHK'D K.J.M.	APPR'D	

TITLE <u>FSMT VENT HEPA FILTER</u>					
NO UNITS REQ'D <u>1</u> NO UNITS OPERATING <u>1</u> SPARE <u>1</u> TYPE (HORIZONTAL <u>X</u>) (VERTICAL <u> </u>)					
TYPE ELEMENT (THROW - AWAY <u>X</u>) (CLEANABLE <u> </u>) OTHER <u> </u>					
PROCESS DESIGN					
NAME OF FLUID FILTERED <u>AIR CONTAINING TRACE QUANTITIES OF GLASS FRIT, WATER VAPOR & FORMIC ACID</u>					
QUANTITY FLUID FILTERED <u>188 (43 A.C.F.M.)</u> #/HR					
OPERATING PRESSURE <u>- 0.2</u> PSIG					
OPERATING TEMPERATURE <u>77-104</u> °F					
DENSITY @ OPER TEMP <u>0.072</u> LB / FT ³					
VISCOSITY @ OPER TEMP <u>0.018</u> C _p					
ALLOWABLE PRESSURE DROP <u>ΔP</u> <u>1.0 CLEAN, 5.0 DIRTY</u> "H ₂ O					
NAME OF PARTICLES REMOVED <u>SOLID FRIT PARTICULATES</u>					
MAXIMUM PARTICLE SIZE <u>177</u> MICRONS					
MINIMUM PARTICLE SIZE <u> </u> MICRONS					
SIZE OF PARTICLES TO BE REMOVED <u>5 MICRONS AND LARGER</u> MICRONS					
QUANTITY OF PARTICLES TO BE REMOVED <u>NEGLIGIBLE</u> # / HR					
MECHANICAL DESIGN					
DESIGN PRESSURE <u>-7/25</u> PSIG DESIGN TEMPERATURE <u>150</u> °F CORROSION ALLOWANCE <u> </u>					
CODES: ASME (YES <input checked="" type="checkbox"/>) (NO <input type="checkbox"/>) STAMP (YES <input checked="" type="checkbox"/>) (NO <input type="checkbox"/>) OTHER <u>NUCLEAR GRADE</u>					
MATERIALS OF CONSTRUCTION					
FILTER CASE	304L SS	*CONNECTIONS	NO	SIZE	RATING
FILTER COVER	304L SS	INLET	1	3"	150#
FILTER ELEMENT SUPPORTS	304L SS	OUTLET	1	3"	150#
FILTER CASE SUPPORTS	304L SS	VENT			
FILTER CONNECTIONS	304L SS	DRAIN			
ELEMENTS		INSTRUMENTS	2	1/2"	NPT(F)
GASKETS					
*ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED					
FILTER COVER TYPE (THRU BOLTED-ON <input type="checkbox"/> , SWING BOLTED-ON <input checked="" type="checkbox"/> , CLAMP-ON <input type="checkbox"/> , SCREWED <input type="checkbox"/> , SPECIAL <input type="checkbox"/> , - SEE NOTES)					
DAVIT (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>): FILTER CASE SUPPORTS (YES <input checked="" type="checkbox"/>) (NO <input type="checkbox"/>) MINIMUM HEIGHT <u> </u>					
SANDBLAST (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>): PAINT PRIMER (YES <input type="checkbox"/>) (NO <input checked="" type="checkbox"/>) <u> </u>					
DATA BY VENDORS					
MFR <u> </u> TYPE NO <u> </u>					
NO REQ'D <u> </u> : NO OPERATING <u> </u> : NO SPARE <u> </u>					
NO ELEMENTS EACH FILTER <u> </u> : SIZE <u> </u> "O.D. <u> </u> x <u> </u> "STR: MATERIAL <u> </u>					
TOTAL ELEMENT DIRT HOLDING CAPACITY <u> </u> CU FT: <u> </u> SURFACE <u> </u> SQ FT					
CLEAN PRESSURE DROP <u> </u> PSI: SHIPPING WEIGHT <u> </u>					
DESCRIBE METHOD OF REMOVING ELEMENTS: <u> </u>					
IS DIMENSIONAL OUTLINE INCLUDED (YES <input type="checkbox"/>) (NO <input type="checkbox"/>) IS FILTER IN ACCORD WITH SPECS (YES <input type="checkbox"/>) (NO <input type="checkbox"/>)					
NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS.					
(2) 85 - 95% EFFICIENT PER ASHRAE 0.3 MICRON DOP TEST					
105\OS\101\204\84571929.001\WP51\01/25/93 4:37pm					SAFETY CLASSIFICATION <u>3</u>

ATTACHMENT A

FLUOR DANIEL DATA SHEET U.S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 HEPA FILTERS	NO.	BY DATE	REVISION	SHEET NO. P33B-DS-20	REV. 0
	▲				
	▲				
	▲				
	▲				
	▲				
	▲				
	▲				
	▲				
	▲				

DATE 01-01-92		CONTRACT 845734
TAG NO. HH-620-001A		
SPECIFICATION SECT. NO. THRU H		
FOR CLIENT USE		
ORIG BY M. Desai	CHK'D LJM	APPR'D

TITLE VITRIFICATION BUILDING HEALTH PROTECTION VACUUM SYSTEM HEPA FILTER

NO UNITS REQ'D 8 NO UNITS OPERATING 4 SPARE 4 TYPE (HORIZONTAL X) (VERTICAL)

TYPE ELEMENT (THROW - AWAY X) (CLEANABLE) OTHER

PROCESS DESIGN

NAME OF FLUID FILTERED AIR (SEE NOTE 2)

QUANTITY FLUID FILTERED 850 (185 SCFM) (580 ACFM) #/HR

OPERATING PRESSURE - 9.53 PSIG

OPERATING TEMPERATURE 78 °F

DENSITY @ OPER TEMP 0.024 LB / FT³

VISCOSITY @ OPER TEMP 0.018 C_p

ALLOWABLE PRESSURE DROP ΔP 1.0 CLEAN, 5.0 DIRTY "H₂O

NAME OF PARTICLES REMOVED PARTICLES CONTAMINATED WITH RADIOACTIVE PARTICLES

MAXIMUM PARTICLE SIZE MICRONS

MINIMUM PARTICLE SIZE MICRONS

SIZE OF PARTICLES TO BE REMOVED 99.97% OF 0.3 MICRONS AND LARGER MICRONS

QUANTITY OF PARTICLES TO BE REMOVED # / HR

MECHANICAL DESIGN

DESIGN PRESSURE 15/FULL VACUUM PSIG DESIGN TEMPERATURE 150 °F CORROSION ALLOWANCE

CODES: ASME (YES ☒) (NO ☐) STAMP (YES ☐) (NO ☒) OTHER NUCLEAR GRADE

MATERIALS OF CONSTRUCTION		*CONNECTIONS	NO	SIZE	RATING
FILTER CASE	304L SS	INLET	1	6"	150#
FILTER COVER	304L SS	OUTLET	1	6"	150#
FILTER ELEMENT SUPPORTS	304L SS	VENT			
FILTER CASE SUPPORTS		DRAIN			
FILTER CONNECTIONS	304L SS	INSTRUMENTS	2	1/2"	NPT(F)
ELEMENTS					
GASKETS					

*ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED

FILTER COVER TYPE (THRU BOLTED-ON ☒) SWING BOLTED-ON ☐) CLAMP-ON ☐) SCREWED ☐) SPECIAL ☐) - SEE NOTES

DAVIT (YES ☐) (NO ☒) FILTER CASE SUPPORTS (YES ☒) (NO ☐) MINIMUM HEIGHT

SANDBLAST (YES ☐) (NO ☒) PAINT PRIMER (YES ☐) (NO ☒)

DATA BY VENDORS

MFR TYPE NO

NO REQ'D NO OPERATING NO SPARE

NO ELEMENTS EACH FILTER SIZE "O.D. x "STR: MATERIAL

TOTAL ELEMENT DIRT HOLDING CAPACITY CU FT: SURFACE SQ FT

CLEAN PRESSURE DROP PSI SHIPPING WEIGHT

DESCRIBE METHOD OF REMOVING ELEMENTS:

IS DIMENSIONAL OUTLINE INCLUDED (YES ☐) (NO ☐) IS FILTER IN ACCORD WITH SPECS (YES ☐) (NO ☐)

NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS

(2) ROOM AIR SATURATED WITH WATER VAPOR.

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ATTACHMENT B
EQUIPMENT MAXIMUM ENVELOPE
AND MODEL NUMBER OR EQUAL

TAG NUMBER	MODEL NUMBER*	MAXIMUM ENVELOPE (inches)		
		LENGTH	WIDTH	HEIGHT
FH-450-001A	Flanders, G-1, CC-D	42	23	23
FH-450-001B	Flanders, G-1, CC-D	42	23	23
FH-460-001A	Flanders, G-1, CC-D	42	23	23
FH-460-001B	Flanders, G-1, CC-D	42	23	23
FH-520-001	Flanders, G-1, CC-D	42	23	23
FH-520-002	Flanders, G-1, CC-D	42	23	23
FH-520-003	Flanders, G-1, CC-D	42	23	23
FH-520-006	Flanders, G-1, CC-D	42	23	23
FH-520-007	Flanders, G-1, CC-D	42	23	23
FH-520-008	Flanders, G-1, CC-D	42	23	23
FH-520-009	Flanders, G-1, CC-D	42	23	23
FH-520-010	Flanders, G-1, CC-D	42	23	23
FH-520-011	Flanders, G-1, CC-D	42	23	23
FH-520-012	Flanders, G-1, CC-D	42	23	23
FH-540-001	Flanders, G-1, CC-D	42	23	23
FH-540-002	Flanders, G-1, CC-D	42	23	23
FL-540-003	Flanders, G-1, CC-D	42	23	23
FL-540-004	Flanders, G-1, CC-D	42	23	23
FL-540-005	Flanders, G-1, CC-D	42	23	23
FL-540-006	Flanders, G-1, CC-F	42	23	23
FL-540-007	Flanders, G-1, CC-F	42	23	23
FL-540-009	Flanders, G-1, CC-F	42	23	23
FL-540-010	Flanders, G-1, CC-F	42	23	23
FL-540-011	Flanders, G-1, CC-F	42	23	23
FL-540-012	Flanders, G-1, CC-F	42	23	23

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FL-560-001A	Flanders, G-1, GG-D	42	23	23
FL-560-001B	Flanders, G-1, GG-D	42	23	23
FL-580-001	Flanders, G-1, GG-D	42	23	23
FH-620-001A	Flanders, G-1, GG-F	60	41	27
FH-620-001B	Flanders, G-1, GG-F	60	41	27
FH-620-001C	Flanders, G-1, GG-F	60	41	27
FH-620-001D	Flanders, G-1, GG-F	60	41	27
FH-620-001E	Flanders, G-1, GG-F	60	41	27
FH-620-001F	Flanders, G-1, GG-F	60	41	27
FH-620-001G	Flanders, G-1, GG-F	60	41	27
FH-620-001H	Flanders, G-1, GG-F	60	41	27

*Equipment shall be of this model number or equal.

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 15898
HEGA FILTERS
B-595-P-P33B-15898

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA	YES	___	NO	<u>X</u>
QUALITY LEVEL	I	___	II	<u>X</u>
SAFETY CLASS	1	___	2	___
	3	<u>X</u>	4	___

ORIGINATOR:

J. J. Ichkhan 1/26/93
J. J. Ichkhan, Mechanical Eng. Date

CHECKER:

D. A. Buzzelli 1-26-93
D. A. Buzzelli, Lead Disc. Checker Date

APPROVED BY:

R. B. Erickson
C. J. Divona Lead Discipline Engineer

1-26-93
Date

SECTION 15898
HEGA FILTERS
B-595-P-P33B-15898

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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>
A	DATA SHEETS
B	EQUIPMENT MAXIMUM ENVELOPE AND MODEL NUMBER OR EQUAL

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**SECTION 15898
HEGA FILTERS**

PART 1 GENERAL

1.1 SUMMARY

This specification section describes the requirements for design, fabrication and testing of high efficiency gas absorber (HEGA) filters to be used in an environmental protection application on the vent stream from the organic acid system.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B1.20.1 1983 (Rev. 92) Pipe Threads, General Purpose (Inch)

ANSI B16.5 1988 Pipe Flanges and Flanged Fittings

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
and/or

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ANSI/ASME N509 1989 Nuclear Power Plant Air Cleaning Units and Components; Interpretations No. 1

ANSI/ASME N510 1989 Testing of Nuclear Air Treatment Systems

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A176 1990 Standard Specification for Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip

ASTM D1056 1985 Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC SP-6 1989 Surface Preparation Specification No. 6, Commercial Blast Cleaning

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1.3 RELATED REQUIREMENTS

Specification Section 01730 Operation and Maintenance Data

Specification Section 05060 Welding Structural

Specification Section 15196 Identification and Tagging Methods
for Mechanical Equipment

1.4 DEFINITIONS

FAT - Factory Acceptance Test

HEGA - High Efficiency Gas Absorber

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 HEGA filter outline drawings, dimensions and weight.

1.6.2 Detail drawings of the HEGA filter and its various components shall be submitted for Buyer approval. These drawings shall include weights, anchor bolt details and materials to be used.

1.6.3 Data Sheets

Seller shall submit complete data sheets for the furnished equipment. These data sheets shall reflect the design parameters in Data Sheets P33B-DS-1 and DS-2 (Attachment A).

1.6.4 A list of recommended spare parts for one (1) year's routine operation shall be supplied. The spare parts list shall include sufficient data to permit procurement from the original manufacturer or any subsupplier.

1.6.5 Operation and maintenance manuals in accordance with Specification Section 01730. Complete installation manuals shall be submitted.

1.6.6 Factory Acceptance Tests (FATs) shall be submitted in accordance with ANSI/ASME N510. The FAT report shall be submitted for Buyer approval.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

- A. Site Elevation 714 feet above sea level
- B. Barometric Pressure 14.3 psia
- C. Outside Design Temperature
 - 1) Maximum Design Temperature 110°F
 - 2) Minimum Design Temperature -20°F
 - 3) Wet Bulb Design Temperature 68°F

1.8.2 Operating Environment

- A. Normal Temperature 60°F to 104°F
- B. Maximum Temperature 104°F
- C. Relative Humidity Not controlled

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

The following requirements apply to the HEGA filters furnished in accordance with this specification section.

2.1.1 Filter Medium - The material for the HEGA filter medium shall be in accordance with ANSI/ASME N509.

2.1.2 HEGA Filter Housing - The materials for the HEGA filter housing shall be in accordance both with ASTM A176 Type 304L and ANSI/ASME N509.

2.1.3 Adhesives - Adhesives used to seal the filter pack into the case and glue gaskets to the case shall either be nonflammable or self-extinguishing. Dried film exposed to open flame shall either not burn or not continue to support combustion when the source of ignition is removed.

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- 2.1.4 Gaskets and Seals - Gasket material shall be oil-resistant and ozone-resistant synthetic rubber, closed cell sponge, Grade RE-43 or TE-43 (high temperature) in accordance with ASTM D1056. The gaskets and seals shall also be resistant to formic acid. This material shall be supplied flat and shall not contain asbestos in any form. The gaskets shall be 1/4 inch thick by 3/4 inch wide. Surfaces shall be split or cut.
- 2.1.5 Clamping Mechanism - The HEGA filter clamping mechanism shall include pressure bars with preloaded springs. These springs shall exert a sealing force of not less than 1200 pounds per filter. This force shall be applied as an even, uniform load along not less than 80 percent of the top and bottom of each filter frame.
- 2.2 **FABRICATION AND MANUFACTURE**
- Fabrication and manufacture of the HEGA filter assembly shall be in accordance with ANSI/ASME N509.
- 2.2.1 The HEGA filter housing shall be designed for bag-in/bag-out capability suitable for installation of a single-element HEGA filter. The housing shall allow the operator to change filters without coming into contact with the filter element.
- 2.2.2 Each housing door shall be equipped with a double-ribbed bag-out port designed to accept an 8-mil polyvinyl chloride (PVC) bag. The housing shall be designed to prevent damage to the bag during the changeout operation.
- 2.2.3 Two bags (one for equipment start-up and one spare) shall be provided and shipped with each HEGA filter housing. These bags shall include an integral choke cord and mittens to facilitate changeout.
- 2.2.4 One banding kit shall be supplied with the HEGA filter housing. The kit shall include all tools and straps necessary for a complete bag-out procedure.
- 2.2.5 HEGA filter housing flanges shall be in accordance with ANSI B16.5. Pipe threads shall be in accordance with ANSI B1.20.1.
- 2.2.6 Welding - All HEGA filter assembly welding shall be in accordance both with ANSI/ASME N509 and Specification Section 05060.
- 2.2.7 Maximum envelope and model number or equal for the HEGA Filter shall be as shown in Attachment B.
- 2.2.8 The HEGA filter housing shall have provisions to be anchored with a minimum of four equally spaced 1/2 inch diameter bolts. The bolt holes shall be 11/16 inch diameter.

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2.3 COATINGS

After completion of all fabrication procedures the external surfaces of each HEGA filter shall be thoroughly cleaned of all foreign material, including rust, in accordance with SSPC SP-6. Manufacturer's standard prime and finish paint or coatings shall be applied. Stainless steel surfaces shall not be painted unless specified otherwise.

2.4 LABELING AND TAGGING

Labeling and tagging shall be in accordance with Specification Section 15196, Paragraph 2.2.2, Type 6. This shall be in addition to the manufacturer's identification plate.

2.5 PACKAGING

2.5.1 Preparation for shipment and packing shall be in accordance with Seller's standards. At minimum, they shall provide protection against corrosion and damage during normal handling, shipping and storage. Minimum preparation shall include the requirements listed below.

2.5.2 Machined surfaces and threads shall be protected during shipment by application of grease or other suitable rust-inhibiting compound.

2.5.3 Flanged openings shall be covered with wood or plastic protectors. Protectors shall be installed with not less than four (4) full diameter steel bolts and nuts.

2.5.4 Threaded connections and tapped holes shall be capped or plugged. Compatible materials shall be used to prevent thread damage.

2.5.5 Bracing, supports and rigging connections shall be provided to prevent damage during shipment, lifting and unloading.

2.5.6 Separate or loose parts shall be completely boxed. The box shall then be attached to the main item to be shipped as a unit.

All shipping boxes shall be identified by Seller's order number, equipment number and equipment description.

PART 3 EXECUTION

(Not Used)

END OF SECTION

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ATTACHMENT A


**FLUOR DANIEL
DATA SHEET**

 U.S. Department of Energy
 Hanford Waste Vitrification Plant
 Richland, Washington
 DOE Contract DE-AC06-86RL10838

HEGA FILTERS

NO. △ △ △ △ △ △	BY DATE	REVISION	SHEET NO. P33B-DS-1	REV. 0
			DATE 02-05-90	CONTRACT 845734
			TAG NO. FG-520-001	
			SPECIFICATION SECT NO. 15898	
			ORIG BY S. Lee	CHK'D K.J.M
			APPR'D	

TITLE **ORGANIC ACID DRAIN CATCH TANK HEGA FILTER**

NO UNITS REQ'D 1 NO UNITS OPERATING 1 SPARE 0 TYPE (HORIZONTAL X) (VERTICAL)

TYPE ELEMENT (THROW - AWAY X) (CLEANABLE) OTHER

PROCESS DESIGN

NAME OF FLUID FILTERED **ORGANIC ACID VAPOR WITH AIR**

QUANTITY FLUID FILTERED 14.43 #/HR

OPERATING PRESSURE -0.1 PSIG

OPERATING TEMPERATURE 77 °F

SPECIFIC GRAVITY @ OPER TEMP (AIR=1.0) - 1.0 LB/FT³

VISCOSITY @ OPER TEMP 0 C_p

ALLOWABLE DIRTY PRESSURE DROP 0 PSI

NAME OF PARTICLES REMOVED **FORMIC ACID VAPORS**

MAXIMUM FLOW RATE 212 lb / HR

MINIMUM FLOW RATE 14 lb / HR

PERFORMANCE RATING 12.5 lbs OF GAS/ 100 lbs OF MEDIA

QUANTITY GAS TO BE REMOVED NIL lb / HR

MECHANICAL DESIGN

DESIGN PRESSURE 2.5/-0.4 PSIG DESIGN TEMPERATURE 150 °F CORROSION ALLOWANCE 1/16"

CODES: ASME (YES ☐) (NO ☒) STAMP (YES ☐) (NO ☒) OTHER NUCLEAR GRADE

MATERIALS OF CONSTRUCTION		*CONNECTIONS	NO	SIZE	RATING
FILTER CASE	304L S.S.	INLET	1	3"	150#
FILTER COVER		OUTLET	1	3"	150#
FILTER ELEMENT SUPPORTS	304L S.S.	VENT	0		
FILTER CASE SUPPORTS	304L S.S.	DRAIN			
FILTER CONNECTIONS		INSTRUMENTS	1	1/2"	NPT(F)
ELEMENTS	PUROFIL II				
GASKETS	FORMIC ACID RESISTANT				

*ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED

FILTER COVER TYPE (THRU BOLTED-ON ☐, SWING BOLTED-ON ☒, CLAMP-ON ☐, SCREWED ☐, SPECIAL ☐ - SEE NOTES)

DAVIT (YES ☐) (NO ☒): FILTER CASE SUPPORTS (YES ☐) (NO ☐) MINIMUM HEIGHT

SANDBLAST (YES ☐) (NO ☐): PAINT PRIMER (YES ☒) (NO ☐)

DATA BY VENDORS

MFR TYPE NO

NO REQ'D : NO OPERATING : NO SPARE

NO ELEMENTS EACH FILTER : SIZE *O.D. x *STR: MATERIAL

TOTAL ELEMENT DIRT HOLDING CAPACITY CU FT: SURFACE SQ FT

CLEAN PRESSURE DROP PSI: SHIPPING WEIGHT

DESCRIBE METHOD OF REMOVING ELEMENTS:

IS DIMENSIONAL OUTLINE INCLUDED (YES ☐) (NO ☐) IS FILTER IN ACCORD WITH SPECS (YES ☐) (NO ☐)

NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS.

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SAFETY CLASSIFICATION 3

ATTACHMENT A


**FLUOR DANIEL
DATA SHEET**

U.S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

HEGA FILTERS

NO.	REVISION	SHEET NO.	REV.
△		P33B-DS-2	0
△		DATE	CONTRACT
△		05-09-89	845734
△		TAG NO.	
△		FG-540-001A	
△		FG-540-001B	
△		SPECIFICATION SECT NO.	
△		15898	
△		ORIG BY	CHK'D
△		J.M. Janzen	S.S.L.
△		APPR'D	

TITLE ORGANIC ACID VENT HEGA FILTERS

NO UNITS REQ'D 2 NO UNITS OPERATING 1 SPARE 1 TYPE (HORIZONTAL X) (VERTICAL)

TYPE ELEMENT (THROW - AWAY X) (CLEANABLE) OTHER

PROCESS DESIGN

NAME OF FLUID FILTERED ORGANIC ACID VENT - NITROGEN (N2), FORMIC ACID (FAK)

QUANTITY FLUID FILTERED 14.43 #/HR

OPERATING PRESSURE 0.072 PSIG

OPERATING TEMPERATURE 77 °F

SPECIFIC GRAVITY @ OPER TEMP (AIR=1.0) 1.0 LB/FT³

VISCOSITY @ OPER TEMP C_p

ALLOWABLE DIRTY PRESSURE DROP 0 PSI

NAME OF GAS REMOVED FORMIC ACID VAPORS

MAXIMUM FLOW RATE 235 lb / HR

MINIMUM FLOW RATE 14 lb / HR

PERFORMANCE RATING ABSORBS 12 lbs OF GAS/ 100 lbs OF MEDIA

QUANTITY OF GAS TO BE REMOVED 0.72 lb / HR

MECHANICAL DESIGN

DESIGN PRESSURE 5/-0.4 PSIG DESIGN TEMPERATURE 750 °F CORROSION ALLOWANCE 1/16"

CODES: ASME (YES ☐) (NO ☒) STAMP (YES ☐) (NO ☒) OTHER

MATERIALS OF CONSTRUCTION		*CONNECTIONS	NO	SIZE	RATING
FILTER CASE	304L S.S.	INLET	1	3"	150#
FILTER COVER		OUTLET	1	3"	150#
FILTER ELEMENT SUPPORTS	304L S.S.	VENT	0		
FILTER CASE SUPPORTS	304L S.S.	DRAIN			
FILTER CONNECTIONS		INSTRUMENTS	1	1/2"	NPT(F)
ELEMENTS	PUROFIL II / PURAKOL				
GASKETS	FORMIC ACID RESISTANT				

*ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED

FILTER COVER TYPE (THRU BOLTED-ON (), SWING BOLTED-ON (X), CLAMP-ON (), SCREWED (), SPECIAL () - SEE NOTES)

DAVIT (YES ☐) (NO ☒): FILTER CASE SUPPORTS (YES ☐) (NO ☐) MINIMUM HEIGHT

SANDBLAST (YES ☐) (NO ☐): PAINT PRIMER (YES ☒) (NO ☐)

DATA BY VENDORS

MFR TYPE NO

NO REQ'D : NO OPERATING : NO SPARE

NO ELEMENTS EACH FILTER : SIZE "O.D. x "STR: MATERIAL

TOTAL ELEMENT DIRT HOLDING CAPACITY CU FT: SURFACE SQ FT

CLEAN PRESSURE DROP PSI: SHIPPING WEIGHT

DESCRIBE METHOD OF REMOVING ELEMENTS:

IS DIMENSIONAL OUTLINE INCLUDED (YES ☐) (NO ☐) IS FILTER IN ACCORD WITH SPECS (YES ☐) (NO ☐)

NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS.

SAFETY CLASSIFICATION 3

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ATTACHMENT B
EQUIPMENT MAXIMUM ENVELOPE AND
MODEL NUMBER OR EQUAL

TAG NUMBER	MODEL NUMBER*	MAXIMUM ENVELOPE (inches)		
		LENGTH	WIDTH	HEIGHT
FG-520-001	Charcoal Services Corp. CSC-1H1W-016-1NB-35	31	40	30
FG-540-001A	Charcoal Services Corp. CSC-1H1W-016-1NB-35	31	40	30
FG-540-001B	Charcoal Services Corp. CSC-1H1W-016-1NB-35	31	40	30

* Equipment shall be of this model number or equal.

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SECTION 16150
MOTORS - INDUCTION FOR GENERAL SERVICE
B-595-P-P33B-16150

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA YES NO X
QUALITY LEVEL I II X
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

CHECKER:

J. J. Ichkhan 1/26/93
J. J. Ichkhan, Mechanical Engineer Date

D. A. Buzzelli 1-26-93
D. A. Buzzelli, Lead Disc. Checker Date

APPROVED BY:

R. B. Erickson
C. J. Divona Lead Discipline Engineer

1-26-93
Date

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SECTION 16150
MOTORS - INDUCTION FOR GENERAL SERVICE
B-595-P-P33B-16150

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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>
A	MOTORS - INDUCTION FOR GENERAL SERVICE
B	INSULATION RESISTANCE READINGS FOR ROTATING EQUIPMENT

SECTION 16150
MOTORS - INDUCTION FOR GENERAL SERVICE

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the technical requirements for standard polyphase induction motors ranging in size from 1/2 horsepower to 300, for vertical and horizontal drive applications.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

ANTI-FRICTION BEARING MANUFACTURERS ASSOCIATION (AFBMA)

AFBMA 9 1990 Load Ratings and Fatigue Life for Ball Bearings

AFBMA 11 1990 Load Ratings and Fatigue Life of Roller Bearings

INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE)

IEEE 43 1974 (Rev. 91) Recommended Practice for Testing Insulation Resistance of Rotating Machinery

IEEE 112 1984 Standard Test Procedure for Polyphase Induction Motors and Generators

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG1 1987 (Rev. 1 1989) Motors and Generators

NEMA MG2 1983 Safety Standard for Construction and Guide for Selection, Installation and Use of Electric Motors

NEMA MG13 1984 Frame Assignments for Alternating Current, Integral-Horsepower Induction Motors

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC SP-6 1989 Surface Preparation Specification No. 6, Commercial Blast Cleaning

9413202.0844

1.3 **RELATED REQUIREMENTS**

Specification Section 01730 Operation and Maintenance Data

Specification Section 15196 Identification and Tagging Methods
for Mechanical Equipment

1.4 **DEFINITIONS**

FAT - Factory Acceptance Test

TEFC - Totally Enclosed Fan Cooled

1.5 **SYSTEM DESCRIPTION**

(Not Used)

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and
Data Requirements section of the Order/Subcontract.

1.6.1 Speed/torque and speed/current curves shall be submitted.

1.6.2 Seller shall complete Data Sheet P33B-DS-1 (Attachment A) and
submit for furnished equipment. Insulation resistance readings
for the electric motors shall be completed by Seller
(Attachment B).

1.6.3 Motor outline drawings, shaft dimensions and weight.

1.6.4 Detail drawings of main and/or auxiliary junction boxes shall be
submitted.

1.6.5 Operation and maintenance manuals in accordance with Specification
Section 01730. Complete installation manuals shall be submitted.

1.6.6 Factory Acceptance Test (FAT) data in accordance with
Paragraph 2.5 shall be submitted.

1.6.7 FATs procedures shall be submitted.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

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1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

- A. Site Elevation 714 feet above sea level
- B. Barometric Pressure 14.3 psia
- C. Outside Design Temperature
 - 1) Maximum Design Temperature 110°F
 - 2) Minimum Design Temperature -20°F
 - 3) Wet Bulb Design Temperature 68°F
- D. Inside Operating Environment
 - 1) Normal Temperature 60°F to 104°F
 - 2) Maximum Temperature 104°F
 - 3) Relative Humidity Not controlled

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

The following requirements apply to all electrical motors furnished in accordance with this specification section. Special electric motor requirements established by the driven equipment specifications and/or Contract Drawings shall take precedence over this specification section.

GENERAL REQUIREMENTS

Electric motors and motor accessories furnished in accordance with this specification section shall be in full conformance to NEMA MG1, NEMA MG2 and NEMA MG13.

A. Motor Rating

Seller shall be fully responsible for specifying electric motor horsepower, speed and torque characteristics for each motor furnished as part of Seller's driven equipment package.

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B. Electrical Power Supply

Motors 1/2 HP to 300 HP furnished in accordance with this specification shall be designed for 480V/3 Phase/60 Hz power supply. Where motors are constant speed they shall be designed for full voltage across the line starting and rated for continuous duty. In applications where the driven equipment calls for variable speed, the electric motor shall be required to be variable-speed squirrel cage induction controlled by available frequency drive. The main power junction box shall be large enough to accommodate oversized incoming power conductors and conductors for externally-mounted power factor correction capacitors. Power junction box shall be rotatable by 90° in each direction. Buyer shall provide variable-frequency starters for variable-speed motors.

C. Grounding

Each electric motor shall include provisions for motor frame grounding. The ground shall utilize a hex head bolt tapped into the motor frame from within the main junction box.

D. Space Heaters

- 1) Electric motor space heaters shall not be provided unless otherwise specified.
- 2) When driven equipment specifications and/or Contract Drawings establish the requirement for electric motor space heaters, they shall operate from 120V/1 Ph/60 HZ power supply with a maximum sheath temperature of 392°F. Space heater electrical leads shall be brought out to a separate junction box mounted to the motor on the opposite side from the main junction box.

E. Elastomers

For general service electric motors, elastomer seals and gaskets shall be compatible with the motor application and/or operating environment.

2.2 FABRICATION AND MANUFACTURE

- 2.2.1 Electrical motors furnished in accordance with this specification section shall be in accordance with NEMA MG1, Normal Starting Torque, Low Slip, Electrical Type A, Design B, for motors with cast iron motor frames.

A. Service Factor

Electric motors shall be designed and selected with a service factor of 1.15 for polyphase motors.

B. High-efficiency motors shall be used for motors of 5 HP and larger.

C. Power factor correction capacitors shall be provided for motors of 20 HP or larger to improve the power factor at the motor terminals to 95 percent when the motor is at 3/4 load.

D. Insulation

Insulation systems for motors on general services shall be Class F or better in accordance both with NEMA MG1 and NEMA MG2. Motor leads shall be copper with compression lugs, both sized for 125 percent load current at motor cooling air discharge temperature.

E. Temperature Rise

Temperature rise in accordance with NEMA MG2 shall not be greater than Class F, 330°F rise above a maximum 104°F ambient temperature.

F. Enclosure

Enclosure shall be totally enclosed fan cooled (TEFC).

G. Seals

Motors shall be equipped with suitable shaft seals. The seals shall prevent moisture, dirt, and corrosive agents from entering the motor enclosure and bearings along the shaft. Seals shall be in accordance with Paragraph 2.1.E.

2.2.2 Bearings

A. General service induction motors shall be furnished with bearing housings designed for re-lubrication of anti-friction bearings, with provisions for flushing out the old lubricant as new lubricant is added. The motor end bells shall be equipped with grease fittings and purge ports for expelled grease.

B. Antifriction bearings shall be in accordance both with AFBMA 9 and AFBMA 11. Each electric motor nameplate shall show the data required by NEMA MG1 and include both front and rear AFBMA bearing part numbers.

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- C. Both ball bearings and roller bearings shall be designed and constructed for 100,000 continuous hours, L-10 minimum life in the specified service in accordance both with AFBMA 9 and AFBMA 11. The design shall be based on continuous service.

2.2.3 Balancing and Vibration Criteria

- A. Motors shall be dynamically balanced per manufacturer's standard practice. Welding or soldering to effect balancing is unacceptable. Parent metal shall be removed to improve balance without affecting the structural strength of the rotating element.

- B. Maximum vibration amplitude in velocity (inch/sec. peak) to obtain a smooth rating for the equipment tested should be as follows:

3600 rpm Motors = 0.0098 inch/sec (0.05 to 0.10 Mils)
1800 rpm Motors = 0.0098 inch/sec (0.10 to 0.20 Mils)
1200 rpm Motors = 0.0098 inch/sec (0.15 to 0.30 Mils)
900 rpm or Smaller Motors = 0.0098 inch/sec (0.20 to 0.36 Mils)

For vibration amplitude measurements, motors shall be operated at rated operating speed and frequency with a one half key installed in the key seat. Motors shall be mounted on isolators during vibration amplitude measurements in accordance with NEMA MG1.

2.3 LABELING

Labeling shall be in accordance with Specification Section 15196, Paragraph 2.2.2, Type 6. This shall be in addition to the manufacturer's identification plate.

2.4 COATINGS

After completion of all fabrication procedures the external surfaces of each electric motor shall be thoroughly cleaned of all foreign material, including rust, in accordance with SSPC SP-6. Manufacturer's standard prime and finish paint or coatings shall be applied. Stainless steel, nickel, brass, copper, monel, aluminum, hastelloy, lead, galvanized steel, plastics, elastomers and glass surfaces shall not be painted unless specified otherwise.

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2.5 TESTING

2.5.1 Factory Acceptance Tests (FATs)

2.5.1.1 Motor Manufacturer Tests

Each electric motor furnished in accordance with this specification section shall be tested by the motor manufacturer prior to shipment. These tests shall include, but shall not be limited to, High-Potential Tests in accordance with NEMA MG1, Part 3 and Routine Tests in accordance with IEEE 112. Seller shall submit certified copies of motor manufacturer's motor test results.

2.5.1.2 Resistance Tests

Seller shall subject all electric motors furnished in accordance with this specification section to insulation resistance tests in accordance with IEEE 43. Insulation resistance measured during these tests shall not be less than 5 megohms. Seller shall submit completed copies of Attachment B for each electric motor furnished. This test shall be done prior to shipping.

2.5.1.3 Performance Test

All required electric motor performance tests shall be conducted in accordance with the applicable driven equipment specification, and the performance testing, referenced in Section 3 of IEEE 112 and NEMA MG1 Part 12.

2.6 PACKAGING

Preparation for shipment and packing may conform to the manufacturer's standards. At minimum, the packaging shall provide protection against corrosion and damage from normal handling and storage. Minimum preparation shall include the requirements listed below.

- A. Machined surfaces, threads, bearings and bearing housings shall be protected during shipment by application of grease or other suitable rust-inhibiting compound.
- B. Threaded connections and tapped holes shall be capped or plugged. Compatible materials shall be used to prevent thread damage.
- C. The motor shall be fully protected against moisture penetration to the electrical compartments and winding.
- D. Mechanical seals and other sealing devices shall be installed for shipment.

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- E. Bracing, supports and rigging connections shall be provided to prevent damage during shipment, lifting and unloading.
- F. Separate or loose parts shall be completely boxed and attached to the main item to be shipped as a unit. All shipping boxes shall be identified by the Seller's order number, equipment number and equipment description.

PART 3 EXECUTION

(Not Used)

END OF SECTION

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Rev. 0

ATTACHMENT B

INSULATION RESISTANCE READINGS FOR ROTATING EQUIPMENT

Description	Area
--------------------	-------------

Test Equipment _____ Ref. _____ Rev. No. _____

Calibration Date _____ Ref. Spec/Section _____

EQUIPMENT NO.	ENVIRONMENTAL CONDITIONS		INSUL. RESIST. Ø-GRD. [Megohms]	TEST VOLTAGE [Megohms]	VISUAL CHECK
	AMBIENT TEMP [°C]	RELATIVE HUMIDITY			
1	25	65	100	1000	OK
2	28	70	150	1000	OK
3	30	75	200	1000	OK
4	32	80	250	1000	OK
5	35	85	300	1000	OK
6	38	90	350	1000	OK
7	40	95	400	1000	OK
8	42	98	450	1000	OK
9	45	100	500	1000	OK
10	48	100	550	1000	OK

SELLER'S REPRESENTATIVE _____ DATE _____

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 16610
ELECTRICAL REQUIREMENTS FOR
PACKAGED MECHANICAL EQUIPMENT
B-595-P-P33B-16610

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA YES NO X
QUALITY LEVEL I II X
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

CHECKER:

Charles C. Simpson 1-27-93
C. C. Simpson, Electrical Engineer Date

Edgar Khouri 1-27-93
Edgar Khouri, Electrical Engineer Date

APPROVED BY:

K. A. Owrey
K. A. Owrey Lead Discipline Engineer

1-27-93
Date

SECTION 16610
ELECTRICAL REQUIREMENTS FOR
PACKAGED MECHANICAL EQUIPMENT
B-595-P-P33B-16610

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1.5 **SYSTEMS DESCRIPTION**

1.5.1 **Power Supply**

1.5.1.1 The available power distribution systems at the Hanford Plant are 480 Vac, three-phase, 60 Hz, three-wire, and 208Y/120 Vac, three-phase, 60 Hz, four-wire.

1.5.1.2 Buyer shall supply 480 volt, three-phase, three-wire with ground service and a motor controller for each 480 volt motor load which is included in this package.

1.5.1.3 Buyer shall provide one or more feeders, as required, to furnish power to all non-motor loads. Feeders shall be 120 volt, single-phase.

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract:

1.6.1 Dimensional outline drawings, for Buyer's review, showing the location of all major electrical equipment, including junction boxes, and conduit. Location and size of conduit connections shall be shown on Seller's equipment.

1.6.2 Elementary diagrams for all circuits shall include line numbers for all ladder logic, in addition all devices with contacts shall reference line number, drawing number, and sheet number where contact appears. The contact shall include the same references back to the device.

1.6.3 Connection diagrams for all electrical equipment. Diagrams shall include equipment identification numbers, terminal block location and identification, and wire numbers.

1.6.4 Detailed bills of material, for Buyer's review, including the name of the manufacturer and catalog number of all electrical components.

1.6.5 Factory Acceptance Tests (FATs) procedures, for Buyer's review, for all tests specified in Paragraph 2.3.

1.6.6 Operation and maintenance manual in accordance with Specification Section 01730, Operation and Maintenance Data.

1.6.7 Manufacturer's Installation Instructions for Buyer's review.

1.6.8 Certified Test Reports, for Buyer's review, per the requirements of Inspection and Testing of this Section.

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1.6.9 Recommended spare parts list.

1.7 **CLASSIFICATION OF SYSTEM AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

1.8.1 Climatic and Geographic Site Conditions

A. Site Elevation 714 feet above sea level

B. Barometric Pressure 14.3 psia

C. Outside Design Temperature

1) Maximum Design Temperature 110°F

2) Minimum Design Temperature -20°F

1.8.2 Operating Environment

A. Indoor Temperatures 60°F to 104°F

B. Relative Humidity Not controlled

PART 2 PRODUCTS

2.1 **MATERIALS AND EQUIPMENT**

2.1.1 General

2.1.1.1 When applicable, all electrical materials and equipment shall be listed by Underwriter's Laboratories and shall bear the UL label.

2.1.1.2 When two or more components of the same specifications are required the components shall be identical, that is, same manufacturer and catalog number.

2.1.2 Conduit

2.1.2.1 Liquid-tight flexible steel conduit shall be in accordance with UL 360.

2.1.2.2 Conduit fittings shall be galvanized steel and in accordance with UL 514B.

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2.1.3 Cable

2.1.3.1 Power and control cables shall be single or multiconductor, stranded copper with 600 volt insulation. Cables shall be UL listed type XHHW or THHN/THWN in accordance with the National Electrical Code, NFPA 70, Article 310.

2.1.3.2 Conductors for power circuits shall not be smaller than No. 12 AWG. Conductors for control circuits shall not be smaller than No. 14 AWG.

2.1.3.3 Instrumentation cables shall be UL listed, twisted, shielded pairs or triads, No. 16 AWG, stranded copper, with a copper drain wire, 300 volt rated PVC insulation and overall PVC jacket.

2.1.4 Terminal Blocks

2.1.4.1 Terminal blocks shall be in accordance with NEMA ICS 4 and UL 1059.

2.1.4.2 Terminal blocks shall be channel mounting type rated 600 volts, with screw type terminals on both sides.

2.1.4.3 Terminal blocks shall have at least 20 percent spare terminals but not less than two spare terminals for each terminal strip.

2.1.5 Junction Boxes

2.1.5.1 Junction boxes shall be NEMA 4X in accordance with NEMA 250, and shall have hinged doors and mounting panels for terminal blocks.

2.1.6 Nameplates

2.1.6.1 All electrical equipment and enclosures shall be identified with nameplates. Nameplates shall be machine-engraved, phenolic, with black figures on white background and shall be firmly attached with stainless steel self-tapping screws.

2.1.7 Grounding

2.1.7.1 All non-current carrying metal parts of electrical equipment shall be bonded together and made electrically continuous.

2.1.7.2 Furnish ground lugs in all junction boxes to terminate ground wires from Buyer's conduits.

2.1.7.3 Furnish two ground pads on the outside frame of the packaged equipment for connection to Buyer's area grounding grid.

2.2 FABRICATION AND MANUFACTURE

- 2.2.1 The electrical installation shall be in accordance with the National Electrical Code, NFPA 70.
- 2.2.2 All wiring shall be continuous from terminal to terminal without splices.
- 2.2.3 All instrument, control device and non-motor loads shall be terminated on terminal blocks in junction boxes.
- 2.2.4 Separate conduit systems and boxes shall be used for each of the following systems:
 - A. 120 V power and control
 - B. Milliamp signals and dc circuits
- 2.2.5 Wiring between electrical components shall be routed in conduit.
- 2.2.6 No more than two wires, or one wire and one jumper strap, shall be terminated on any one terminal block terminal screw. Where more wires are required, additional terminals shall be used. No uninsulated, exposed conductors shall extend beyond the sides of the terminal block or its insulated barriers. Each terminal block shall have its own identification numbers. Furnish terminals for all ground wires, and for all drain wires in the instrument cables.
- 2.2.7 Flexible liquid-tight conduit shall be used to avoid transmission of vibration from vibrating equipment. Flexible conduit shall also be used to terminate equipment which is periodically removed such as instruments.
- 2.2.8 Conduit connections to junction boxes shall be made using water-tight threaded hubs, or factory threaded hubs.
- 2.2.9 Junction boxes shall be sized in accordance with the requirements of National Electrical Code, NFPA 70, Article 370.
- 2.2.10 Identification
 - 2.2.10.1 Wire and Cable
 - 2.2.10.1.1 Identification of conductors shall be by means of heat shrinkable insulated tubing with conductor identification by heat impressed black on white characters, Thomas and Betts Catalog No. WHT-700 or approved equal.

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- 2.2.11 Conductors shall be identified at each end. Identification shall be by individual and distinctive numbers for each conductor, i.e., 1, 2, 3, 4, ...

2.3 INSPECTION AND TESTING

2.3.1 Factory Inspection

- 2.3.1.1 The equipment shall be inspected at the factory to assure compliance with the specifications, standards and codes and any additional requirements listed in this specification. Submit a report confirming the FATs procedure has been completed.
- 2.3.1.2 Furnish all materials, power supply, motor controllers and test equipment required to perform tests, checks, inspections and the FATs, in accordance with this specification section. Seller has the option of using equipment in his possession with valid National Institute of Standards and Technology Certification of equipment or can use the service of a testing lab with valid National Institute of Standards and Technology Certification.
- 2.3.1.3 The calibrating and testing equipment used for tests, checks, inspections and the FATs shall be calibrated within six months prior to testing. Seller shall provide proof of calibration.
- 2.3.1.4 Equipment failing the standards test shall not be used until repaired and re-standardized. All calibrating and testing equipment shall have valid certified label affixed to the equipment during usage. The label shall be affixed in a prominent location. The Buyer can, at his discretion, require the calibrating and testing equipment to be checked to the standards. Standards shall not be used as calibration and testing devices in the field.
- 2.3.1.5 Inspection shall include, but not necessarily be limited to, the following items:
- 2.3.2 Wire and Cable Tests
- 2.3.2.1 Continuity Test
- A. Test for continuity, correctness of wiring and verify correct identification on all conductors installed.
- B. Test shall be made with an ohmmeter.
- 2.3.2.2 Insulation Resistance Test
- A. All conductors shall be given an insulation resistance test using a megohmmeter.

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- B. Test shall be made with the lugs in place and conductors disconnected at the equipment. Test shall be made between one conductor and ground with the other conductors grounded. Each conductor shall be tested in the same manner.
- C. Test voltages and minimum acceptable insulation resistance shall be as follows:

<u>Insulation Voltage</u>	<u>Test Voltage</u>	<u>Min. Insulation Resistance</u>
300 volt ac	500 Vdc	10 megohms
600 volt ac	1000 Vdc	10 megohms

PART 3 EXECUTION

(Not Used)

END OF SECTION

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U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 17703
INSTRUMENT PIPING MATERIALS
B-595-P-P33B-17703

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA YES NO X
QUALITY LEVEL I II X
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

D. G. Van Houten 01/25/93
D. G. Van Houten, Control Systems Date

CHECKER:

B. R. Carlisle 1/25/93
B. R. Carlisle, Control Sys. Eng. Date

APPROVED BY:

J. B. Bunning
J. B. Bunning Lead Discipline Engineer

01/25/93
Date

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SECTION 17703
INSTRUMENT PIPING MATERIALS
B-595-P-P33B-17703

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**SECTION 17703
INSTRUMENT PIPING MATERIALS**

PART 1 GENERAL

1.1 SUMMARY

This section includes the technical requirements for the furnishing of instrument piping materials for the Vibrating Filters instrumentation.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B16.11 1980 Forged Steel Fittings, Socket-Welding and Threaded

AMERICAN PETROLEUM INSTITUTE (API)

API STD 598 1990 Valve Inspection and Testing

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B1.1 1989 Unified Inch Screw Threads (UN and UNR Thread Form)

ANSI/ASME B1.20.1 1983 Pipe Threads, General Purpose (Inch)

ASME/ANSI B16.10 1986 Face-to-Face and End-to-End Dimensions of Valves (Revision of ANSI B16.10 - 1973)

ASME B31.3 1990 Chemical Plant and Petroleum Refinery Piping, Including Addenda "a" and "b"

ANSI/ASME B36.10M 1985 Welded and Seamless Wrought Steel Pipe

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A182/A182M 1990 Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service

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ASTM A269	1990 Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
ASTM A312/A312M	1991 Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes
ASTM A403/A403M	1991 Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings

MANUFACTURERS STANDARDIZATION SOCIETY OF THE
VALVE AND FITTINGS INDUSTRY, INC. (MSS)

MSS SP-25	1978 Standard Marking System for Valves, Fittings, Flanges and Unions (R 1988)
MSS SP-61	1985 Pressure Testing of Steel Valves

1.3 RELATED REQUIREMENTS

Specification Section 01730	Operation and Maintenance Data
Specification Section 17704	General Instrumentation Installation and Testing
Specification Section 17893	Instruments Furnished with Mechanical Equipment Frit Slurry Filters

1.4 DEFINITIONS

NPT	- National Pipe Thread
PEEK	- Poly-Ether-Ether-Ketone
PSIA	- Pounds per Square Inch Absolute
PSIG	- Pounds per Square Inch Gauge
TFE	- Polytetrafluoroethylene (Teflon or Equal)

1.5 SYSTEM DESCRIPTION

Material furnished under this specification section conforms to ASME B31.3.

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Catalog information: Including overall dimensions, weight, model number, and connection sizes.

- 1.6.2 The Seller shall provide a list of materials to be incorporated in the work. The list of materials shall be supported by sufficient descriptive material to demonstrate conformance to the specification section requirements.
- 1.6.3 Detailed parts list including manufacturer's part numbers.
- 1.6.4 Certified Material Test Reports for all pressure containing or wetted parts.
- 1.6.5 Factory Acceptance Test Report in accordance with Specification Section 17893, Paragraph 2.3.
- 1.6.6 Manufacturer's Operation and Maintenance Manuals in accordance with Specification Section 01730.
- 1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**
(Not Used)
- 1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**
- 1.8.1 Climatic and Geographic Site Conditions
- | | |
|--------------------------------|--------------------------|
| A. Site Elevation | 714 feet above sea level |
| B. Barometric Pressure | 14.3 psia |
| C. Outside Design Temperature | |
| 1) Maximum Design Temperature | 110°F |
| 2) Minimum Design Temperature | -20°F |
| 3) Wet Bulb Design Temperature | 68°F |
- 1.8.2 Operating Environment
- | | |
|-------------------------|----------------|
| A. Normal Temperatures | 68°F to 78°F |
| B. Maximum Temperatures | 104°F |
| C. Minimum Temperature | 60°F |
| D. Relative Humidity | Not Controlled |

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PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 General Requirements

2.1.1.1 Instrument piping material classes and service symbols as listed conform to service designations as shown on the Contract Drawings.

2.1.1.2 All stainless steel materials in this specification require submittal of Certified Material Test Reports.

2.1.1.3 Unless otherwise specified, all pressures and temperatures listed are design conditions.

2.1.1.4 Pipe threads shall conform to ANSI/ASME B1.20.1.

2.1.1.5 Instrument Piping Material Classes/Services Index

<u>Instrument Class</u>	<u>Material</u>	<u>Service</u>
ZA	316 Stainless Steel	FSK - Cold Frit Slurry LPW - Process Water PAX - Plant Air CDX - Chemical Drain
ZJ	316 Stainless Steel	IAX - Instrument Air (Non Process)

2.1.2 Instrument Material

2.1.2.1 Instrument Material Class ZA

Material: 316 Stainless Steel
Temperature Limit: -20°F to 400°F
Rating: 3000#
Maximum Pressure: Per ANSI B16.11
Construction: 3/4" and smaller - screwed and/or compression type tube fittings

<u>Items</u>	<u>Size</u>	<u>Description</u>
Tubing	1/2"	Seamless, 316 stainless steel tubing, ASTM A269, .049" average wall thickness, hardness not to exceed Rockwell B80.

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Tube Fittings	3/4" and smaller	316 stainless steel, compression type with double ferrules. (Swagelok or equal)
Plug	1/2" and smaller	Square head plug, forged 316 stainless steel, screwed, ASTM A182/A182M, GR F316, ANSI B16.11.
Pipe Nipples	1/2"	Seamless, schedule 80S 316 stainless steel, ASTM A312/A312M, Grade TP316.
Bleed Tee	1/2"	Bleed Tee, 316 stainless steel body. Inlet connection 1/2" male NPT, outlets 1/2" female NPT. (AGCO Model BTS-44 or equal).
Swage Nipples	1-1/2" and smaller	Seamless, schedule 80S 316 stainless steel, ASTM A403/A403M, Grade WP316, concentric, threaded ends.

VALVES

<u>Items</u>	<u>Size</u>	<u>Description</u>
Needle Valve	1/2"	Needle, 3000#, 316 stainless steel, soft seat, inlet connection 1/2" male NPT, outlet connection 1/2" female NPT. Body and Bonnet: 316 stainless steel Stem: 316 stainless steel Seat: PEEK Packing: TFE
Bleed Valve	1/2"	Bleed valve, 316 stainless steel body and bonnet, 316 stainless steel stem, TFE packing, PEEK seat material, inlet connection 1/2" male NPT. (AGCO Model V6VES-4 or equal).
Manifold Valve	1/2"	5-valve manifold, 2 block valves, 1 equalizing valve, 2 calibration valves and 2 test elbows, flanged x screwed, 1/2" female NPT connections. Body and Bonnet: 316 stainless steel Stem: 316 Stainless Steel Seat: PEEK Packing: TFE Accessories: Mount Bracket

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CONSTRUCTION DETAILS

Pipe Bends: None

Tubing Bends: Use tubing bends in place of tubing fittings wherever possible. Tubing bends shall be formed with tools designed for the tubing diameter. Minimum 1-1/2" radius bends for 1/2" tubing.

Thread Compound: Use an anaerobic thread sealant on pipe threads.

Note 1: Do not thread tubing. Use compression type fittings.
Note 2: Tubing size is average outside diameter, not nominal size.

2.1.2.2 Instrument Material Class ZJ

Material: 316 Stainless Steel
Temperature Limit: 150°F
Rating: 3000#
Maximum Pressure: ANSI B16.11
Construction: 1-1/2" and smaller - screwed and/or compression type tube fittings

<u>Items</u>	<u>Size</u>	<u>Description</u>
Pipe	1-1/2" and smaller	Seamless, schedule 40S 316 stainless steel, ASTM A312/A312M, Grade TP316.
Tubing	1/4"	Seamless 316 stainless steel tubing, ASTM A269, .035" average wall thickness, hardness not to exceed Rockwell B80.
	1/2"	Seamless 316 stainless steel tubing, ASTM A269, .049" average wall thickness, hardness not to exceed Rockwell B80.
Pipe Fittings	1-1/2" and smaller	90° ell, 3000# forged 316 stainless steel, screwed, ASTM A182/A182M, ANSI B16.11.
	1-1/2" and smaller	Cap, 3000# forged 316 stainless steel, screwed, ASTM A182/A182M, ANSI B16.11.
	1-1/2" and smaller	Tee, 3000# forged 316 stainless steel, screwed, ASTM A182/A182M, ANSI B16.11.

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	1-1/2" and smaller	Union, 3000# forged 316 stainless steel, screwed, ASTM A182/A182M, ANSI B16.11.
	1-1/2" and smaller	Square head plug, forged 316 stainless steel, screwed, ASTM A182/A182M, Grade F316, ANSI B16.11.
Pipe Nipples	1-1/2" and smaller	Seamless, Schedule 80S 316 stainless steel, ASTM A312/A312M, Grade TP316. Threaded ends.
Swage Nipples	1-1/2" and smaller	Seamless, schedule 80S, 316 stainless steel, ASTM A403/A403M, Grade WP 316, concentric. Threaded ends.

<u>Items</u>	<u>Size</u>	<u>Description</u>
Tube Fittings	1/2" and smaller	316 stainless steel, compression type with double ferrules (Swagelok or equal).

VALVES

<u>Items</u>	<u>Size</u>	<u>Description</u>
Ball Valve	1/4"	Ball valve, 316 stainless steel body and stem, TFE packing, nylon handle with position stops, 1/4" compression type tube connections.
Ball Valve	1/2"	Ball valve, 316 stainless steel body and stem, TFE seat material, 1/2" female NPT connections.

CONSTRUCTION DETAILS

Pipe Bends:	None
Tubing Bends:	Use tubing bends in place of tubing fittings wherever possible. Tubing bends shall be formed with tools designed for the tubing diameter. Minimum tubing bends shall be: 1" radius bends for 1/4" tubing 1-1/2" radius bends for 1/2" tubing
Thread Compound:	Use an anaerobic thread sealant on pipe threads.

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Note 1: Do not thread tubing. Use compression type fittings.

Note 2: Tubing sizes are average outside diameter, not nominal size.

2.1.3 Supplemental Requirements

These material requirements are intended to supplement "Description" contained in Paragraph 2.1.2 (Instrument Material), of this specification. In the event of a conflict, the "Description" in the applicable paragraph shall govern.

2.1.3.1 Valves

- A. Lever operated valves shall be furnished with individual levers, wrenches, or handles.
- B. Tapped holes in valve bodies, where required, shall be threaded in accordance with ASME B1.1, Unified Inch Screw Threads. Threads shall be the Coarse Thread Series with Class 2B tolerances.
- C. Valves shall have face-to-face (or end-to-end) dimensions in accordance with ASME/ANSI B16.10, where applicable.

2.1.3.2 Pipe and Tubing

- A. Pipe and tubing furnished with circumferential butt welds is not permitted.
- B. Austenitic stainless steel pipe and tubing shall be furnished in the solution annealed condition.
- C. Substitution of schedules, weight or thicknesses, other than those specified shall be submitted to the Buyer for approval prior to fabrication.
- D. Welded seam pipe shall not be substituted for pipe specified as seamless.
- E. Stainless steel tubing shall be supplied in nominal 20 foot straight lengths.
- F. Metallic pipe shall be supplied in random lengths.
- G. Nominal pipe sizes shall be in accordance with ANSI/ASME B36.10M.
- H. Nominal wall thicknesses of steel pipe and fittings shall be in accordance with ANSI/ASME B36.10M.

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- I. Pipe specified as Schedule 40 and Schedule 80 shall be in accordance with ANSI/ASME B36.10M.
- J. Unless otherwise specified, metallic pipe finish shall be the manufacturer's standard mill protective type coating, with no deposits in the interior.
- K. Unless otherwise specified, metallic tubing finish shall be the manufacturer's standard mill finish.
- L. Plain end pipe 1-1/2 inches and smaller shall be furnished with ends square cut, no bevel.
- M. Threaded end pipe shall have taper pipe threads in accordance with ANSI/ASME B1.20.1.
- N. Exposed threaded ends of pipe shall be fitted with thread protectors.
- O. Plain tubing ends shall be capped.
- P. Precautions shall be taken to prevent scratching of exterior surfaces of tubing.

2.1.3.3 Fittings

- A. Austenitic stainless steel shall be furnished in the solution annealed condition.
- B. Stainless steel compression fittings shall be produced from material in accordance with ASTM A182/A182M, F316.
- C. Substitution of schedules, weights or thicknesses, other than those specified, shall be submitted to the Buyer for approval prior to fabrication of affected piping.
- D. Mitered type fittings (made by joining sections of pipe) are not permitted.
- E. Pipe and tubing shall be joined by fittings and unions.
- F. Pipe bends shall not be used in place of fittings, except where so specified in Paragraph 2.1.2, or on the Contract Drawings.
- G. When reducing within, to or from screwed construction, use a swage nipple.
- H. Fabricated type tees (made by joining sections of pipe) are not permitted.

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- I. Tapered reducers (reducers without knuckle radius offsets) are not permitted.

2.1.4 Labeling

- 2.1.4.1 Piping components shall be marked and identified by the manufacturer in accordance with the applicable ASTM standards and MSS SP-25.

2.2 FABRICATION AND MANUFACTURE

(Not Used)

2.3 FACTORY ACCEPTANCE TESTS (FAT)

- 2.3.1 Valves shall be pressure tested in accordance with the following:

- A. All valves shall be inspected and tested in accordance with the standard to which they are manufactured.
- B. Valves not covered by a standard shall be tested in accordance with the procedure MSS SP-61, Pressure Testing of Steel Valves, or API STD 598, Valve Inspection and Testing, except that test pressures shall be as follows:

Shell	1.5 x P*
Seat	1.0 x P*

P* = The nonshock cold water, oil or gas (WOG) pressure rating specified by the manufacturer.

- C. The valve stem packing used during the pressure testing shall be the same that is supplied with the valve.

- 2.3.2 Provide test records including:

- A. Item tested
B. Date of test
C. Tester or data recorder
D. Type of observation
E. Results and acceptability
F. Action taken in connection with any deviations noted
G. Person evaluating test results
H. Test equipment and calibrations

2.4 PACKING AND SHIPPING

- 2.4.1 Instrument material shall be packed and protected by the manufacturer's standard packing materials to ensure safe shipment and storage at the jobsite prior to installation.

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PART 3 EXECUTION

3.1 PREPARATION

(Not Used)

3.2 INSTALLATION, APPLICATION AND ERECTION

3.2.1 Preparation and fabrication of components into assemblies or systems, as well as erection and installation, shall be in accordance with manufacturer's instructions, Specification Section 17704.

3.3 FIELD QUALITY CONTROL

(Not Used)

3.4 ADJUSTMENTS

(Not Used)

3.5 CLEANING

(Not Used)

3.6 PROTECTION

(Not Used)

3.7 DEMONSTRATION

(Not Used)

3.8 SCHEDULES

(Not Used)

END OF SECTION

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U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 17704
GENERAL INSTRUMENTATION INSTALLATION AND TESTING
B-595-P-P33B-17704

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA YES NO X
QUALITY LEVEL I II X
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

CHECKER:

David Yi 1/25/93
D. Yi, Control Systems Engineer Date

B. R. Carlisle 1/25/93
B. R. Carlisle, Control Sys. Eng. Date

APPROVED BY:

J. B. Bunning
J. B. Bunning Lead Discipline Engineer

01/25/93
Date

SECTION 17704
GENERAL INSTRUMENTATION INSTALLATION AND TESTING
B-595-P-P33B-17704

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SECTION 17704
GENERAL INSTRUMENTATION INSTALLATION AND TESTING

PART 1 GENERAL

1.1 SUMMARY

This section defines the general requirements for the installation and testing of instrumentation and directs the Seller to specific Specifications for each instrument.

The Seller's work shall conform to the paragraphs of this standard specification which apply to the Seller's scope of work defined in the Order/Subcontract.

1.2 REFERENCES

(Not Used)

1.3 RELATED REQUIREMENTS

Specification Section 16610	Electrical Requirements for Packaged Equipment
Specification Section 17703	Instrument Piping Materials
Specification Section 17893	Instruments Furnished with Mechanical Equipment Frit Slurry Filters

1.4 DEFINITIONS

DBE - Design Basis Earthquake

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

(Not Used)

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

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1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

- A. Site Elevation 714 feet above sea level
- B. Barometric Pressure 14.3 psia
- C. Outside Design Temperature
 - 1) Maximum Design Temperature 110°F
 - 2) Minimum Design Temperature -20°F
 - 3) Wet Bulb Design Temperature 68°F

1.8.2 Operating Environment

- A. Normal Temperature 68°F to 78°F
- B. Maximum Temperature 104°F
- C. Minimum Temperature 60°F
- D. Relative Humidity Not Controlled

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- 2.1.1 Provide instruments in accordance with Specification Section 17893.
- 2.1.2 Provide piping material in accordance with Specification Section 17703.

2.2 FABRICATION AND MANUFACTURE

(Not Used)

PART 3 EXECUTION

3.1 PREPARATION

- 3.1.1 Inspect instruments to confirm they meet the requirements of the Section that specified them.

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3.2 INSTALLATION, APPLICATION, AND ERECTION

3.2.1 Instrument Mounting

3.2.1.1 Mount instruments in accordance with the manufacturers' instructions.

3.2.1.2 Install instrument stands and column supports plumb and level.

3.2.2 Instrument Piping

3.2.2.1 Install air supply, pneumatic signal, and process sensing piping/tubing in accordance with manufacturers' installation instructions.

3.2.2.2 Locate pipe and tubing to make it inconvenient to use as a step or handhold.

3.2.3 Instrument Wiring

3.2.3.1 Install instrument wiring in accordance with manufacturers' installation instructions and Specification Section 16610.

3.3 FIELD QUALITY CONTROL

(Not Used)

3.4 ADJUSTMENTS

(Not Used)

3.5 CLEANING

(Not Used)

3.6 PROTECTION

(Not Used)

3.7 DEMONSTRATION

(Not Used)

3.8 SCHEDULES

(Not Used)

END OF SECTION

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U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 17892
FRIT SLURRY FILTER LOCAL PANELS
B-595-P-P33B-17892

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA YES NO X
QUALITY LEVEL I II X
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

CHECKER:

David Yi 01/25/93
D. Yi, Control Systems Engineer Date

B. R. Carlisle 1/25/93
B. R. Carlisle, Control Sys. Eng. Date

APPROVED BY:

J. B. Bunning
J. B. Bunning Lead Discipline Engineer

01/25/93
Date

SECTION 17892
FRIT SLURRY FILTER LOCAL PANELS
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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>
A	FUNCTIONAL DESCRIPTION

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SECTION 17892
FRIT SLURRY FILTER LOCAL PANELS

PART 1 GENERAL

1.1 SUMMARY

This section defines the requirements for Local Panels LP-580-003 and LP-580-004. The panels will control the operation of Process Frit Slurry Feed Tank (PFSFT) Filter and Decontamination Frit Slurry Feed Tank (DFSFT) Filter, specified in Section 15894.

1.2 REFERENCES

- 1.2.1 The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

FACTORY MUTUAL (FM)

Directory 1991 Approval Guide

INSTRUMENT SOCIETY OF AMERICA (ISA)

ISA RP60.6 1984 Nameplates, Labels and
Tags for Control Centers

ISA S20 1981 Specification Forms for
Process Measurement and Control
Instruments, Primary Elements
and Control Valves

MILITARY STANDARD (MIL-STD)

MIL-STD-1472D 1989 Human Engineering Design
Criteria for Military Systems,
Equipment and Facilities Change
Notice 1, 1991

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA 250 1985 Enclosures for Electrical
Equipment (1000 Volts Maximum)
(Revision 1 - May 1986,
Revision 2 - May 1988)

NEMA ICS 3 1983 Industrial Systems,
(Section 304)
(Revision 1 - July 23, 1990)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NEPA 70

1990 National Electrical Code

U.S. NUCLEAR REGULATORY COMMISSION (NUREG)

NUREG-0700

1981 Guidelines for Control
Room Design Reviews;
September 1981

UNDERWRITERS LABORATORIES INC. (UL)

Directory

1990 Electrical Appliance and Utilization Equipment Directory

Directory

1991 Recognized Component Directory

UL 83

1983 Thermoplastic-Insulated
Wires and Cables Ninth Edition;
February 22, 1989

UL 486A

1991 Wire Connectors and
Soldering Lugs for use with
Copper Conductors Eighth
Edition; October 8, 1991

UL 1059

1988 Terminal Blocks Second
Edition: July 16, 1991

1.2.2 Reference Drawings

Drawing No. H-2-123070
Sheet 4

P&ID System 58, Process Frit
Slurry Pump and Filter

Drawing No. H-2-123070
Sheet 6

P&ID System 58, Decon Frit
Slurry Pump and Filter

1.3 RELATED REQUIREMENTS

Specification Section 01730

Operation and Maintenance Data

Specification Section 15894

Vibrating Filters

Specification Section 17893

Instruments Furnished with Mechanical Equipment Frit Slurry Filters

Drawing No. H-2-121653

LP-580-003 and 004 Instrument
Panel Layout

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1.4 DEFINITIONS

DCS	- Distributed Control System
DFSFT	- Decontamination Frit Slurry Feed Tank
FAT	- Factory Acceptance Test
LCD	- Liquid Crystal Display
LP	- Local Panel
MTBF	- Mean Time Between Failures
PCD	- Process Control Description
PFSFT	- Process Frit Slurry Feed Tank
PLC	- Programmable Logic Controller
PSID	- Pounds Per Square Inch, Differential
VDDR	- Vendor Drawing and Data Requirements

1.5 SYSTEM DESCRIPTION

The P&ID H-2-123070, Sheets 4 and 6; Specification Section 15894 and 17893; Attachment A; and Panel Layout Drawing H-2-121653 describe a generic system and its control requirements. The Seller shall design the control configurations, sequence logic, and interlock logic to implement the specific control system required for the safe, efficient operation of the mechanical equipment being furnished, including the interface with the instruments and control systems not in this Order/Subcontract.

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements (VDDR) section of the Order/Subcontract.

Use only the following drawing sizes:

- A 8-1/2 by 11 inches
- B 11 by 17 inches
- D 28 by 40 inches

- 1.6.1 Catalog cuts describing each instrument and accessory.
- 1.6.2 Manufacturers' installation drawings and instructions.
- 1.6.3 Manufacturers' operation and maintenance manuals in accordance with Section 01730.
- 1.6.4 P&IDs showing the Seller's system and its interface to the rest of the plant. The Buyer will furnish instrument tag numbers on the approval prints for Seller's instruments not shown on P&ID H-2-123070 Sheets 4 and 6 listed in Paragraph 1.3.
- 1.6.5 Process Control Description (PCD) - a narrative describing the system operation, including normal and abnormal conditions, start-up and shutdown. Use the following outline:

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TITLE

1.0 GENERAL DESCRIPTION

2.0 OPERATING DESCRIPTION

2.1 Routine Operations

2.2 Infrequent Normal Operations

2.3 Abnormal Conditions

1.6.6 Instrument data sheets similar to ISA S20, completed in accordance with ISA S20 instructions.

1.6.7 General arrangement drawings, front and rear views, including provisions for anchorage.

1.6.8 Rear view showing internal layout of instruments and accessories.

1.6.9 Electrical elementary diagrams showing devices, power wiring, signal wiring, and terminations.

1.6.10 Panel wiring diagram, shown as a not-to-scale expanded rear view with devices and terminal blocks in their correct relative positions, conduit duct layouts, wire routing, and terminations.

1.6.11 Instrument list showing tag number, service, manufacturer, model number, range, and setpoint if applicable.

1.6.12 Factory Acceptance Tests (FAT) procedure including requirements in Paragraph 2.3.1.

1.6.13 Report confirming the FAT procedure was executed and the results.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

A. Site Elevation 714 feet above sea level

B. Barometric Pressure 14.3 psia

C. Outside Design Temperature

1) Maximum Design Temperature 110°F

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2) Minimum Design Temperature -20°F

3) Wet Bulb Design Temperature 68°F

1.8.2 Operating Environment

- A. Normal Temperature 68° to 78°F
- B. Maximum Temperature 104°F
- C. Minimum Temperature 60°F
- D. Relative Humidity Not controlled

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 General Requirements

2.1.1.1 The control panels, accessories, materials, and instrumentation shall operate under the conditions of Paragraph 1.8.

2.1.1.2 Provide accessories, materials, and methods of fabrication not included in this specification, but which are necessary to complete the fabrication of the control panels.

2.1.1.3 When two or more components with the same specifications are required, the components shall be identical (same manufacturer and catalog number).

2.1.1.4 Electrical components or devices which operate at voltages higher than 30 volts or energy greater than 100 VA shall be UL Listed, UL Recognized Components, or FM Approved Devices (refer to UL and FM directories).

2.1.2 Panel and Accessories

2.1.2.1 The basic panels LP-580-003 and LP-580-004 shall be standard, type 304 stainless steel, factory made, ANSI/NEMA 250, Type 4X enclosures, Hoffman or equal. The panels shall have provisions to be mounted to the equipment with four 1/4 inch diameter bolts. Bolt holes shall be 5/16 inch diameter.

2.1.3 Instruments

2.1.3.1 Provide a stainless steel tag, 18 ga. minimum, with the instrument tag number and Seller's service description stamped or engraved, affixed to each instrument with stainless steel wire (preferred), stainless steel screws, or rivets. If the instrument size or

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configuration prevents use of a separate tag, propose an alternate method of tagging, such as engraving or stamping, for Buyer's approval.

2.1.3.2 Instruments provided by the Seller shall include the features listed by instrument type below:

2.1.4 Automatic Backwash Controllers

2.1.4.1 Provide Automatic Backwash Controllers (R-PLC™) or equal, to perform control, sequence, and alarm functions based on the control configuration, timing sequence, and inputs from the field instruments.

The Controllers shall incorporate the following criteria:

- A. Power input 120 Vac 60 Hz
- B. Operating voltage and dip recovery in accordance with NEMA ICS 3-304.40 and 3-304.41
- C. Electrical noise tolerance in accordance with NEMA ICS 3-304.42
- D. Application program stored in EPROM.
- E. User configuration memory stored up to 5 days during power loss.
- F. I/O optically isolated solid-state design unless relay interface is required.
- G. Field experience records or calculations to verify the overall MTBF of the Automatic Backwash Controllers (R-PLC) equals or exceeds 20,000 hours.
- H. Menu index parameters to perform configuration, enable/disable functions, and timing sequence operation.
- I. LCD (0.25 inches minimum character size with 2 x 16 columns) and alphanumeric keypad for operator interface.
- J. Automatic backwash capability initiated by differential pressure setpoint.
- K. Dry contact outputs for common trouble alarm, power failure alarm, and controller failure alarm.

2.1.5 Electrical Selector Switches

- A. Heavy duty, oil-tight, corrosion resistant, maintained 3-position selector switches.
- B. Contact blocks with screw terminals, rated for the load to be switched.

2.1.6 Pushbutton Switch

- A. Heavy duty, oil-tight, corrosion resistant, full guard, pushbutton switches.
- B. Contact blocks with screw terminals, rated for the load to be switched.

2.1.7 Status Indicators

- A. Indicators in accordance with Panel Layout Drawing listed in Paragraph 1.3.
- B. Indicators with at least 50,000 hour life.

2.2 FABRICATION AND MANUFACTURE

2.2.1 Panel Modifications

- 2.2.1.1 Modify the panels described in Paragraph 2.1.2 as necessary to support the instrumentation and accessories to be mounted in the panels. The panels shall retain their ANSI/NEMA 250, Type 4X ratings after the modifications have been made.

2.2.2 Panel Interior Environment

- 2.2.2.1 Prevent operating temperature from exceeding instrument/equipment manufacturers' operating limits.
- 2.2.2.2 Prevent condensation during shipping, storage, and operation.

2.2.3 Painting

Painting is not required on these panels.

2.2.4 Instrument Mounting

- 2.2.4.1 Mount and support instruments in accordance with manufacturers' installation documents.
- 2.2.4.2 Adjustments shall be readily accessible. Instruments and components shall be replaceable without disturbing wiring or other equipment.

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- 2.2.4.3 Layout front panel instruments in accordance with MIL-STD-1472D and NUREG 0700. Instrument Panel Layout Drawing H-2-121653 complies with these specifications.
- 2.2.5 Nameplates
- 2.2.5.1 Make nameplates from 1/16 inch thick laminated plastic stock with white surface and black core, except as noted on Instrument Panel Layout Drawing. Bevel the edges and remove burrs.
- 2.2.5.2 Engrave with Helvetica Bold Condensed capital letters. If abbreviations can't be avoided, use abbreviations from ISA RP60.6. Other abbreviations are subject to Buyer's approval.
- 2.2.5.3 Fasten the nameplates to the panel with stainless steel Number 4-40 screws or 1/8 inch drive rivets.
- 2.2.5.4 Provide 1 inch maximum height nameplates with instrument tag numbers engraved in 1/8 inch high letters on the back the panel to show the location of front and back of panel mounted instruments.
- 2.2.5.5 Make front of panel nameplates as shown on Instrument Panel Layout Drawing (H-2-121653).
- 2.2.6 Panel Piping
- Piping is not required on these panels
- 2.2.7 Panel wiring
- 2.2.7.1 Wiring material and installation methods shall comply with NFPA 70, Article 725, Class 1 or Class 2.
- 2.2.7.2 Use No. 16 AWG stranded copper wire with MTW insulation conforming to UL 83.
- 2.2.7.3 Terminate conductors on screw terminals with tin plated copper, compression ring-tongue, nylon insulated terminals in accordance with UL 486A. Use Thomas and Betts Catalog No. RB-14 (#18-14 AWG) and RC-10 (#12-10 AWG) or equal.
- 2.2.7.4 Identify wires at both ends with white tubular shrink-on sleeves with permanently imprinted black characters. Use the same number throughout the run of daisy chained wires.
- 2.2.7.5 Use the instrument tag number and a sequential number for the wire number. Use the same sequential number for the same instrument terminal on similar instruments.
- 2.2.7.6 Support wiring in metal or plastic raceway or conduit.

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- 2.2.7.7 Provide channel mounted terminal blocks with Number 8 screws, rated 600 volts and in compliance with UL 1059. Use Allen Bradley catalog number 1492-CD3 or equal.

Provide an even number of spare terminals greater than 25 percent of terminals used.

- 2.2.7.8 Provide a copper safety ground bus bolted to the panel frame with screws to connect 8 or more 10-14 AWG ground wires.

- 2.2.7.9 Divide the main incoming 120 Vac power by system or function. Install a fused disconnect switch on the line (hot) side of each circuit. Color code the wires as follows:

Hot - Black
Neutral - White
Ground - Green

- 2.2.7.10 If power from external systems, such as the control voltage from motor starters, comes in to the panel, provide a red nameplate with white letters stating:

CAUTION
120 VAC CIRCUITS FROM
EXTERNAL SOURCES MAY BE
ENERGIZED WHEN THE PANEL
MAIN BREAKER IS OPEN

- 2.2.7.11 Install a duplex receptacle on a separate 120 Vac circuit to power test equipment.

- 2.2.7.12 Provide two spare fuses of each type used in the panel. Seal them in a clear plastic bag marked "Spares" and tie-wrap them to the panel interior.

- 2.2.7.13 A lamp test pushbutton switch shall be provided to illuminate all panel lights when depressed.

2.2.8 Programming and Configuration

- 2.2.8.1 Design control circuits to fail safe condition on loss of power.

- 2.2.8.2 Design discrete circuits to operate on 120 Vac, to have contacts closed (power) during normal operation, and to have contacts open on abnormal conditions to cause alarms and shutdowns.

- 2.2.8.3 Design control logic for the LP-580-003 and LP-580-004 for the routine, manual, and abnormal conditions described in the Attachment A.

2.2.9 Interface To Other Instrument And Computer Systems

These panels are designed as stand-alone systems, system will generate necessary alarm outputs to the DCS.

2.3 FACTORY ACCEPTANCE TESTS (FAT)

2.3.1 Prepare a Factory Acceptance Test (FAT) procedure and submit it for approval. Include:

- A. Inspection tests to demonstrate that the fabrication and assembly of the materials and equipment meet the requirements of the design drawings and specifications.
- B. Physical inspection to determine that instruments are new and not damaged.
- C. Inspect installation, location, mounting, and piping.
- D. Inspection of applicable code compliance.
- E. Full functional test of instrument systems to determine operability.
- F. All electrical control circuits shall be tested and verify wiring and equipment functionality.

2.3.2 Inspect and test instrument installations according to the Buyer approved FAT procedure.

2.3.3 Submit a report confirming the FAT procedure has been completed and the results. Include:

- A. Item tested
- B. Date of test
- C. Tester or data recorder
- D. Type of observation
- E. Results and acceptability
- F. Action taken in connection with any deviations noted
- G. Person evaluating test results
- H. Test equipment and calibrations

2.4 PACKAGING AND SHIPPING

2.4.1 Reinstall shipping stops which were removed for calibration and testing.

2.4.2 Install temporary additional shipping supports for instruments and equipment to be shipped mounted in the panel. Identify temporary shipping supports by contrasting color, tag or label to simplify location and removal prior to installation of equipment.

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- 2.4.3 Repack loose instruments and equipment, including those removed for shipment, in the manufacturer's original packing material. Accumulate these in a separate crate marked "INSTRUMENTS" and labeled to allow traceability back to main equipment component.
- 2.4.4 Package all shipped materials to eliminate damage from moisture, vibration, shock and heat damage while in transit or interim storage.

PART 3 EXECUTION

(Not Used)

END OF SECTION

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**ATTACHMENT A
FUNCTIONAL DESCRIPTION**

Each Frit Slurry Vibrating Filter system has multiple filter elements. Each filter element contains a vibrator powered by plant air. Backwashing is initiated automatically when the differential pressure across the system reaches 15 PSID. The backwash sequence may also be initiated manually.

The following description applies to both the Process Frit Slurry Filtration System, FL-580-002V, and the Decontamination Frit Slurry Filtration System, FL-580-003V. The information in parenthesis refers to FL-580-003V.

From the DCS (provided by Buyer), the transfer (recirculation) control program, YCP-FSK-024 (YCP-FSK-062), will open the transfer (recirculation) pump air supply valve, YV-PAX-350 (YV-PAX-195), and later will open the filter vibrator air supply valve, YV-PAX-340 (YV-PAX-215).

During transfer (recirculation), solids will accumulate on the filter element surfaces. This will increase the differential pressure across the filter system. When the differential pressure exceeds 15 PSIG, sensed by PDI-FSK-028 (PDI-FSK-059), the filter system controller will initiate a backwash cycle. Each element will be backflushed individually for 10-20 seconds. The filter system will be sized so that the flowrate through the filter system will not be affected by having one element out of service for backflushing.

When the transfer (recirculation) is complete and the piping has been flushed with water, the flush water supply valve will close, causing low flow through the filter system, sensed by FAL-FSK-031 (FAL-FSK-062) which will close YV-PAX-350 (YV-PAX-195) and YV-PAX-340 (YV-PAX-215).

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U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 17893
INSTRUMENTS FURNISHED WITH MECHANICAL EQUIPMENT
FRIT SLURRY FILTERS
B-595-P-P33B-17893

APPROVED FOR CONSTRUCTION

REVISION 0
ISSUE DATE 2-2-93

WAPA YES NO X
QUALITY LEVEL I II X
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

CHECKER:

David Yi 01/25/93
D. Yi, Control Systems Engineer Date

B. R. Carlisle 1/25/93
B. R. Carlisle, Control Sys. Eng. Date

APPROVED BY:

J. B. Bunning
J. B. Bunning Lead Discipline Engineer

01/25/93
Date

SECTION 17893
INSTRUMENTS FURNISHED WITH MECHANICAL EQUIPMENT
FRIT SLURRY FILTERS
B-595-P-P33B-17893

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SECTION 17893
INSTRUMENTS FURNISHED WITH MECHANICAL EQUIPMENT
FRIT SLURRY FILTERS

PART 1 GENERAL

1.1 SUMMARY

This section defines the requirements for the supply, installation, inspection, and testing of instruments furnished with Vibrating Filters specified in Section 15894. It does not apply to control panels.

1.2 REFERENCES

1.2.1 The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ANSI/ASME B1.20.1 1983 Pipe Threads, General Purpose (Inch)
(Revision and Redesignation of ANSI B21.1 - 1968)

ASME/ANSI B16.5 1988 Pipe Flanges and Flanged Fittings

FLUID CONTROLS INSTITUTE, INC. (FCI)

ANSI/FCI 70-2 1976 American National Standard for Control Valve Seat Leakage
(Reaffirmed April 29, 1982)

FACTORY MUTUAL (FM)

Directory 1991 Approval Guide

INSTRUMENT SOCIETY OF AMERICA (ISA)

ISA S20 1981 Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves

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Rev. 0

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA 250 1985 Enclosures for Electrical
Equipment (1000 Volts Maximum)
(Revision 1 - May 1986,
Revision 2 - May 1988)

UNDERWRITERS LABORATORIES INC. (UL)

Directory 1990 Electric Appliance and
Utilization Equipment Directory

Directory 1991 Recognized Component
Directory

UL 429 1982 Electrically Operated
Valves Third Edition; November,
1988

1.2.2 Reference Drawings

Drawing No. H-2-123070 P&ID - System 58, Process Frit
Sheet 4 Slurry Pump and Filter

Drawing No. H-2-123070 P&ID - System 58, Decon Frit
Sheet 6 Slurry Pump and Filter

1.3 RELATED REQUIREMENTS

Specification Section 01730 Operation and Maintenance Data

Specification Section 15894 Vibrating Filters

Specification Section 16610 Electrical Requirements for
Packaged Equipment

Specification Section 17704 General Instrumentation
Installation and Testing

Specification Section 17892 Frit Slurry Filter Local Panels

1.4 DEFINITIONS

DPDT - Double Pole Double Throw

FAT - Factory Acceptance Test

LP - Local Panel

VDDR - Vendor Drawing and Data Requirements

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1.5 SYSTEM DESCRIPTION

The system and Seller's responsibilities for detailed system design are defined in Article 1.5 of Section 17892 Frit Slurry Filter Local Panels and related requirements in Paragraph 1.3.

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements (VDDR), section of the Order/Subcontract.

Use only the following drawing sizes:

- A 8-1/2 by 11 inches
- B 11 by 17 inches
- D 28 by 40 inches

- 1.6.1 Catalog cuts describing each instrument and accessory.
- 1.6.2 Manufacturers' installation drawings and instructions.
- 1.6.3 Manufacturers' operation and maintenance manuals in accordance with Section 01730.
- 1.6.4 Instrument data sheets similar to ISA S20, completed in accordance with ISA S20 instructions.
- 1.6.5 Plan and elevation drawings with dimensioned locations for instrument and control devices, connections to the mechanical equipment, air supply connections, and terminal boxes.
- 1.6.6 Process tubing detail drawings.
- 1.6.7 Pneumatic tubing detail drawings.
- 1.6.8 Terminal box layout drawings showing location and identification of terminals, conduit sizes and entrance locations.
- 1.6.9 Electrical connection diagrams (point to point wiring).
- 1.6.10 Instrument list showing tag number, service, manufacturer, model number, range, and setpoint if applicable.
- 1.6.11 Factory Acceptance Test (FAT) procedure including requirements in Paragraph 2.3.1.
- 1.6.12 Report confirming the FAT procedure was executed and the results.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

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1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

- A. Site Elevation 714 feet above sea level
- B. Barometric Pressure 14.3 psia
- C. Outside Design Temperature
 - 1) Maximum Design Temperature 110°F
 - 2) Minimum Design Temperature -20°F
 - 3) Wet Bulb Design Temperature 68°F

1.8.2 Operating Environment

- A. Normal Temperature 68° to 78°F
- B. Maximum Temperature 104°F
- C. Minimum Temperature 60°F
- D. Relative Humidity Not controlled

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 General Requirements

- 2.1.1.1 Provide instrumentation required for the application, including correct range, pressure and temperature rating, and materials of construction to operate under the conditions of Paragraph 1.8.
- 2.1.1.2 Provide accessories, materials, and methods of fabrication not included in this specification, but which are necessary to complete the installation of the instrumentation.
- 2.1.1.3 When two or more components of the same specifications are required, provide identical components (same manufacturer and catalog number).
- 2.1.1.4 Electrical and electronic instruments, control devices, and components which operate at voltages higher than 30 volts or energy greater than 100 VA shall be UL Listed Devices, UL Recognized Components, or FM Approved Devices (refer to UL and FM directories).

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- 2.1.1.5 Instrument electrical enclosures shall be ANSI/NEMA 250, Type 4X.
- 2.1.1.6 Pneumatic power shall be used to supply diaphragm and piston-operated control valves and valve accessories such as valve positioners.
- 2.1.1.7 Pneumatic systems shall operate on a 3 to 15 psig signal.
- 2.1.1.8 Electronic analog signals shall be 4 - 20 mAdc.
- 2.1.1.9 Discrete signals shall be 120 Vac.
- 2.1.1.10 Instruments range, span, setpoints and controller settings, which are not specified in this Section, shall be selected by the mechanical equipment Seller.
- 2.1.1.11 Design electrical control circuits to fail-safe on loss of power.
- 2.1.1.12 Instrument power supplies shall be powered by 120 Vac, 60 Hz.
- 2.1.1.13 Switches and relay contacts shall be suitable for the switched load.
- 2.1.1.14 Instrument connections:
- A. Flanged connections shall be in accordance with ASME/ANSI B16.5.
 - B. Threaded connections shall be in accordance with ANSI/ASME B1.20.1.
- 2.1.2 Instruments
- 2.1.2.1 Instruments provided by Seller shall include the features listed by instrument type below:
- 2.1.2.2 Pressure Gauges
- A. 4-1/2 inch dial.
 - B. Accuracy within +/-0.5 percent full scale.
 - C. 316 stainless steel pressure element.
 - D. Shatter proof glass.
 - E. Blowout back protection.
 - F. Tube ratings and overpressure at least 1.3 times maximum scale reading.
 - G. Process connections 1/2 inch NPT

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2.1.2.3 Solenoid Valves

- A. Three-way or four-way valves, direct acting, mounted, and piped to the control valves.
- B. Valves ported to produce the valve failure action required in the de-energized state.
- C. Solenoid coils in accordance with UL 429.
- D. 1/4 inch NPT valve port connections.
- E. 1/2 inch NPT electrical connections.

2.1.2.4 Ball Valves

- A. 90° rotation of the ball.
- B. Full open port equal to line size unless otherwise specified.

2.1.2.5 Self-Actuated Pressure Regulators

- A. Self-contained or pilot operated, with adjustable setpoint.
- B. Select regulator capacity based on 10 percent offset or drop factor.
- C. Seat leakage requirements in accordance with ANSI/FCI 70-2, Class IV.

2.1.2.6 Differential Pressure Switches

- A. Snap acting DPDT switches rated for matched load.
- B. Switch set to actuation point prior to installation.
- C. Setpoint adjustment by means of internal screw.
- D. 1/2 inch NPT high and low process connections.
- E. 3/4 inch NPT electrical connections.
- F. Setpoint repeatability within 0.5 percent of full scale.
- G. Setpoint differential (dead band) fixed and not more than 3 percent of the switch setting.
- H. Accuracy within 1 percent of full scale.
- I. Calibration shift less than 0.5 percent at maximum overpressure of the primary element.

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2.2 FABRICATION AND MANUFACTURE

2.2.1 Instrument Mounting

2.2.1.1 Mount and support instruments in accordance with manufacturers' installation documents, contract drawings, and Section 17704.

2.2.1.2 Adjustments shall be readily accessible, instruments and components shall be replaceable without disturbing wiring or other equipment.

2.2.2 Instrument Piping

2.2.2.1 Install the instrument piping components in accordance with manufacturers' installation documents, contract drawings, and Section 17704.

2.2.3 Instrument wiring

2.2.3.1 Wiring material and installation shall comply with Section 16610.

2.3 FACTORY ACCEPTANCE TESTS (FAT)

2.3.1 Prepare a Factory Acceptance Test (FAT) procedure and submit it for approval. Include:

- A. Inspection/tests to demonstrate that the fabrication and assembly of the materials and equipment meet the requirements of the design drawings and specifications.
- B. Check for applicable code compliance.
- C. Inspect electrical installations and test electrical circuits for operability.
- D. Check and test pneumatic circuits for operability.
- E. Calibration test for each instrument.
- F. Full functional test of instrument systems to determine operability.

2.3.2 Inspect and test the instrument installations according to the Buyer approved FAT procedure.

2.3.3 Submit a report confirming the FAT procedure has been completed and the results. Include:

- A. Item tested
- B. Date of test
- C. Tester or data recorder

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- D. Type of observation
- E. Results and acceptability
- F. Action taken in connection with any deviations noted
- G. Person evaluating test results
- H. Test equipment and calibrations

2.4 PACKAGING AND SHIPPING

- 2.4.1 Reinstall shipping stops which were removed for calibration and testing.
- 2.4.2 Install temporary additional shipping supports for instruments and equipment to be shipped mounted on the mechanical equipment. Identify temporary shipping supports by contrasting color, tag or label to simplify location and removal prior to installation of equipment.
- 2.4.3 Repack loose instruments and equipment, including those removed from the shipment, in the manufacturer's original packing material. Accumulate these in a separate crate marked "INSTRUMENTS" and labeled to allow traceability back to the main equipment component.
- 2.4.4 Package all shipped materials to eliminate damage from moisture, vibration, shock and heat damage while in transit or interim storage.

PART 3 EXECUTION

(Not Used)

END OF SECTION

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